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**U. S. HOUSE OF REPRESENTATIVES**

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Chairman Whitfield, Ranking Member Rush and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the Renewable Fuel Standard (RFS) program.

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. By law, EIA's data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government, so the views expressed herein should not be construed as representing those of the Department of Energy or any other Federal agency. As discussed in my testimony, EIA is active in providing both data and analysis that bear directly on the RFS program.

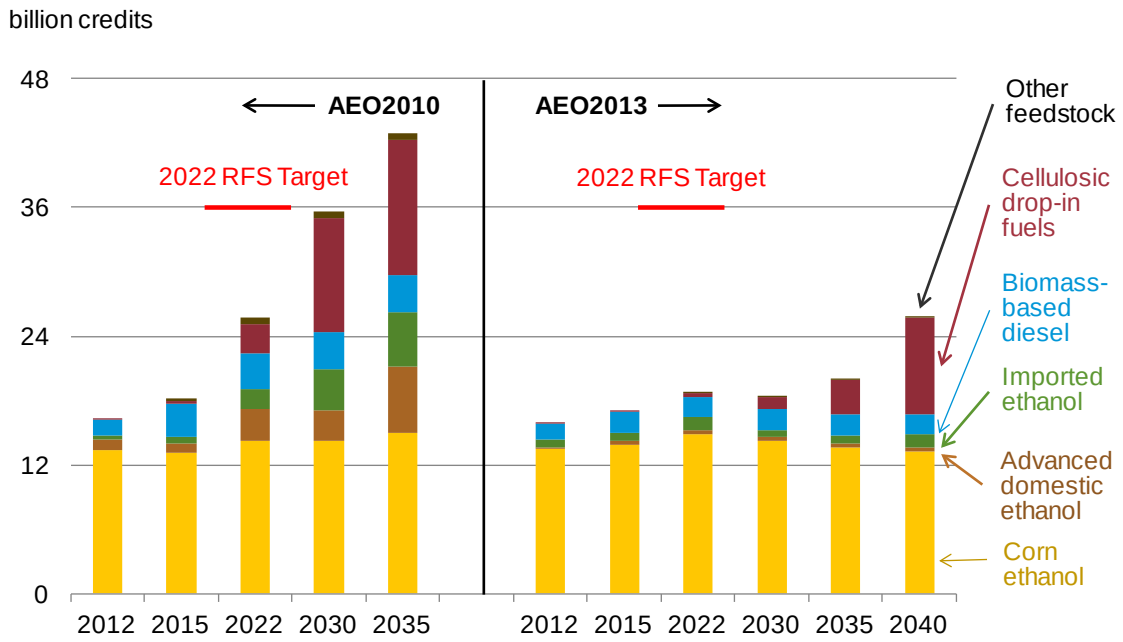
The main points of my testimony are as follows:

1. **The RFS program is not projected to come close to achievement of the legislated target that calls for 36 billion gallons of renewable motor fuels use by 2022**. This is not a new or surprising finding – all of EIA's Annual Energy Outlook (AEO) Reference case projections since the present RFS targets were enacted in 2007 have indicated that the Environmental Protection Agency (EPA) would need to apply the flexibility provided in the law to reduce requirements for cellulosic, advanced, and total biofuels from their legislatively-specified targets. Figure 1 presents EIA's Reference case projections from AEO2013, issued in late 2012, as well as those from AEO2010 that were developed and published in late 2009. (For purposes of this figure and this testimony, RFS projections are discussed in terms of RFS credits, since biofuels receive credit towards the RFS targets on the basis of their energy content relative to ethanol rather than on a strict volumetric basis. For example, each gallon of biodiesel provides approximately 1.5 credits towards the overall RFS target.) AEO2010 already

projected a shortfall of over 10 billion gallons of overall RFS credits relative to the legislated target for 2022. In AEO2013, the shortfall relative to the legislated target in 2022 is projected at 17 billion credits, slowly improving in later years as biofuels use rises. Virtually all the projected shortfall is in the category of advanced biofuels.

EIA's projections suggest that EPA will need to decide how to apply its regulatory discretion regarding the advanced and total RFS targets as allowed by law. Through the 2012 RFS program year and its proposed rulemaking for the 2013 RFS program year, EPA has acted to reduce RFS compliance levels for cellulosic biofuels. EIA's Short-term Energy Outlook (STEO) projections for 2014 as well as the AEO2013 assume that the EPA will exercise its statutory authority to reduce future RFS compliance levels for cellulosic, advanced and total biofuels.

Figure 1. Projected availability of RFS credits in AEO2012 and AEO2013




*Source: EIA, Annual Energy Outlook 2010, Annual Energy Outlook 2013.*

2. **Substantially increased use of biofuels can only occur if they can be used in forms other than the low-percentage blends of ethanol and biodiesel that account for nearly all of their current use.** The RFS targets enacted in 2007 cannot be approached through the current low-percentage blending of ethanol and biodiesel into motor fuels. There are three potential alternative pathways (1) Increased use of higher ethanol blends, (2) the advent of drop-in biofuels, such as renewable gasoline or renewable diesel, that can be used as direct replacements for their petroleum-based counterparts, and (3) the development and use of new renewable fuel components, such as biobutanol, that might be more easily blended in increased volumes. To date, none of these options has achieved a significant market role.

3. **The implicit premise that cellulosic and other advanced biofuels would be available in significant quantities at reasonable costs within 5 to 10 years following adoption of the 2007 RFS targets has not been borne out.** Advanced biofuels other than biodiesel (including cellulosic ethanol and cellulosic drop-in biofuels), which were already projected to fall well below the targeted levels for 2022 in AEO2010, arrive even more slowly in AEO2013. The most important cellulosic technology in the AEO2013 is pyrolysis to produce cellulosic drop-in fuels, although some cellulosic ethanol is also produced. Biofuels producer KiOR initiated operations at a facility using pyrolysis technology in Columbus, Mississippi. The AEO2013 Reference case projections assume continuing technology progress and cost reduction, but they do not assume any breakthroughs in transformational biofuels technologies, such as low-cost, scalable, algae biofuels. Such breakthroughs, if they were to occur, could make a big difference.

4. **Ethanol potentially has three distinct roles in motor fuels markets, serving as an octane enhancer, as a volume source, and as a provider of energy content. Ethanol has achieved considerable**

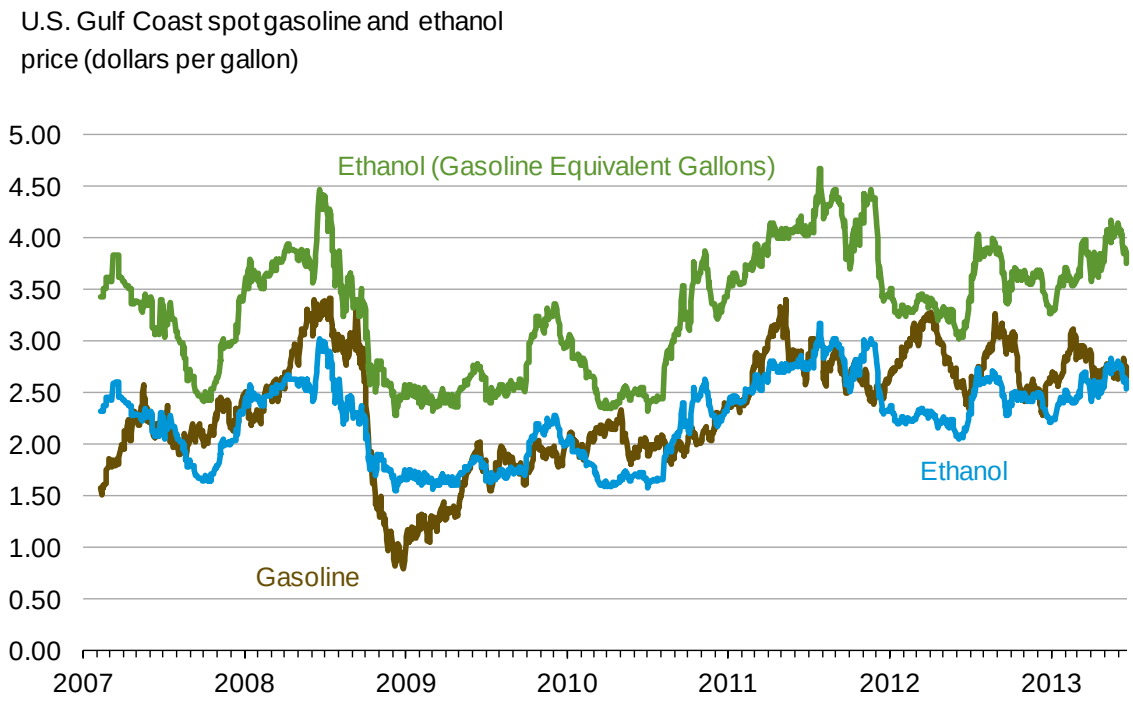
**market success in the first two roles, but not in the third, where it faces a significantly higher economic hurdle.**

Ethanol's major ramp up during the last decade was initially tied to its role as an octane enhancer following the phase out of Methyl Tertiary Butyl Ether (MTBE) by several states in the early 2000s, and later on a national basis following enactment of the 2005 Energy Policy Act. In this role, the use of ethanol is not very sensitive to its price.

The further use of ethanol as a source of fuel volume was enabled when it began to be generally available at a cheaper price than gasoline on a volumetric basis – see Figure 2. (Figure 2 prices do not reflect the availability of blender tax credits through 2011, which added to the attraction of ethanol blending.) With all vehicles warranted for use with blends containing up to 10 percent ethanol (E10), and consumers taking little or no notice of the lower energy content of E10 relative to petroleum-only gasoline (E0), the attractive cost of ethanol relative to gasoline drove the market to blend ethanol up to the 10-percent limit.

With the possible use of higher-percentage blends such as E15 and E85, where ethanol provides a larger proportion of the energy in each gallon of fuel, one important behavioral question is when consumers start to notice the impact of ethanol's lower energy content per gallon on the range provided by a tankful of fuel and factor that impact into their buying decisions. Experience in Brazil, where high-percentage ethanol fuels are widely sold, suggests that consumers consider energy-content pricing (top line in Figure 2) rather than simply buying the cheapest gallons. In fact, the range penalty associated with less energy-dense fuels may require that they be sold at a discount to their relative energy value to be attractive to most buyers.

Figure 2. Ethanol is cheaper than gasoline on a volumetric basis but more expensive than gasoline in energy equivalent terms




*Source: EIA, Bloomberg. Ethanol data are available from February 9, 2007 onward.*

5. **Ethanol faces some major demand and distribution system challenges that make it difficult to increase its use as a motor fuel regardless of its source.** While much of the wholesale distribution infrastructure is capable of handling ethanol, which to date has been moved by rail rather than pipelines, significant changes in the retail infrastructure would be needed to carry higher-ethanol blends of motor gasoline. The AEO2013 Reference case anticipates some penetration of both E15 and E85, but not nearly enough to approach the legislated RFS target.

   Although EPA has granted waivers allowing the use of E15 in model year 2001 and newer light-duty vehicles, very few gasoline retailers currently offer E15 for sale to the public due to concerns related

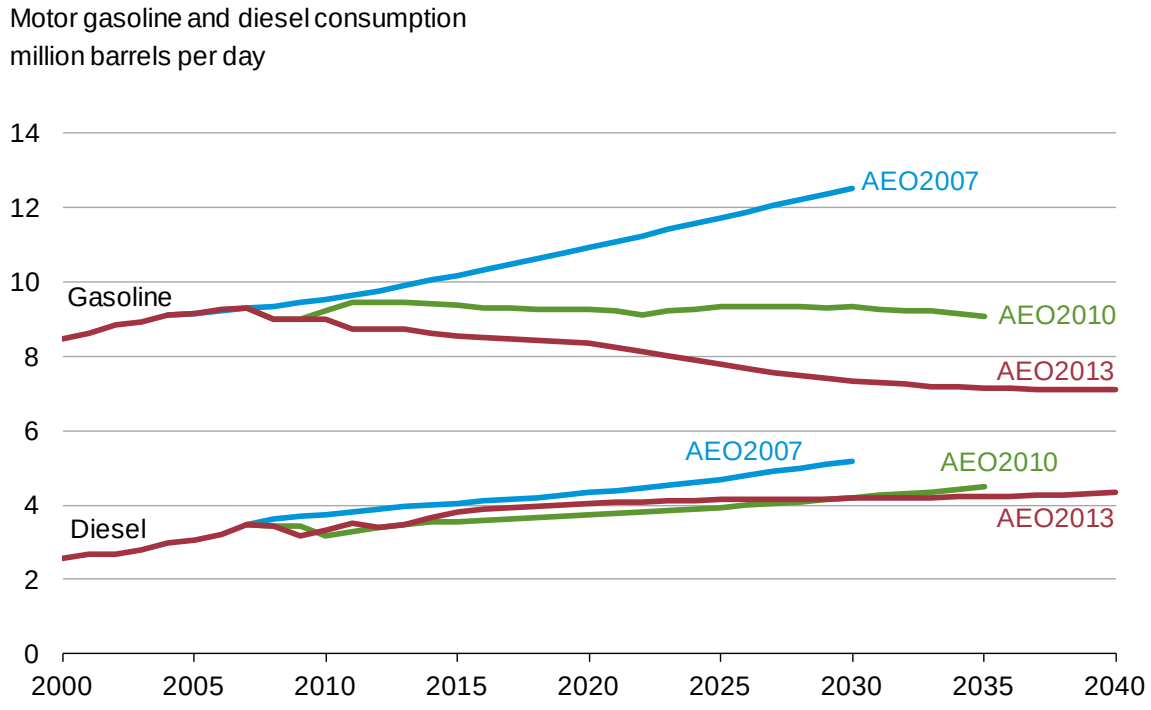
to automobile warranties, potential liability for misfueling, infrastructure costs, and consumer acceptance. Also, E15 does not qualify for the one pound Reid Vapor Pressure (RVP) waiver that was legislated for E10, so it would not be an environmentally compliant fuel in summer months when made using most current gasoline blend stocks.

E85 is more widely available at retail fuel stations, but can only be used in designated flex-fuel vehicles (FFVs). Currently, there are about 11.5 million FFVs in use, about 5.1 percent of the overall light duty vehicle fleet. Manufacturers built flex fuel capability into these vehicles in order to receive credits towards compliance with fuel economy standards under provisions that are being phased out under the implementation of future Corporate Average Fuel Economy (CAFE) and greenhouse gas emissions standards promulgated by the National Highway Traffic and Safety Administration (NHTSA) and the EPA. Without vehicle manufacturer incentives to produce additional FFVs and absent a strong consumer demand for them, which will depend on consistent E85 pricing that at least reflects its lower energy content, the potential for growth in the E85 will remain limited.

6. **The projected declining trend in motor gasoline use in AEO2013 (Figure 3) reflects a significant change from earlier projections of growth (AEO2007) or stasis (AEO2010). Changes in the projections for gasoline use since AEO2007 mainly reflect higher vehicle fuel economy standards adopted subsequent to its release, together with slower economic growth, higher gasoline prices, and possible changes in consumer behavior.** EIA's current projection for gasoline demand in 2014 (June 2013 STEO) is 133.1 billion gallons, almost 14 percent lower than the 2014 projection in AEO2007 (153.9 billion gallons). Lower levels of gasoline demand, both actual and projected, proportionately reduce the opportunity for use of ethanol as an octane or volume enhancer in E10 gasoline blends. Lower gasoline demand has likely affected the timing of some current RFS

compliance challenges that are briefly discussed later in this testimony. However, in contrast to the issues raised in my previous points, it is not a cause of the persistent past and projected shortfall of the RFS program relative to its legislated targets. By 2030, the AEO2013 Reference case projection of gasoline demand is 80 billion gallons, or 41 percent, below the AEO2007 Reference case projection.

Figure 3. U.S. motor gasoline and diesel consumption, 2000-2040

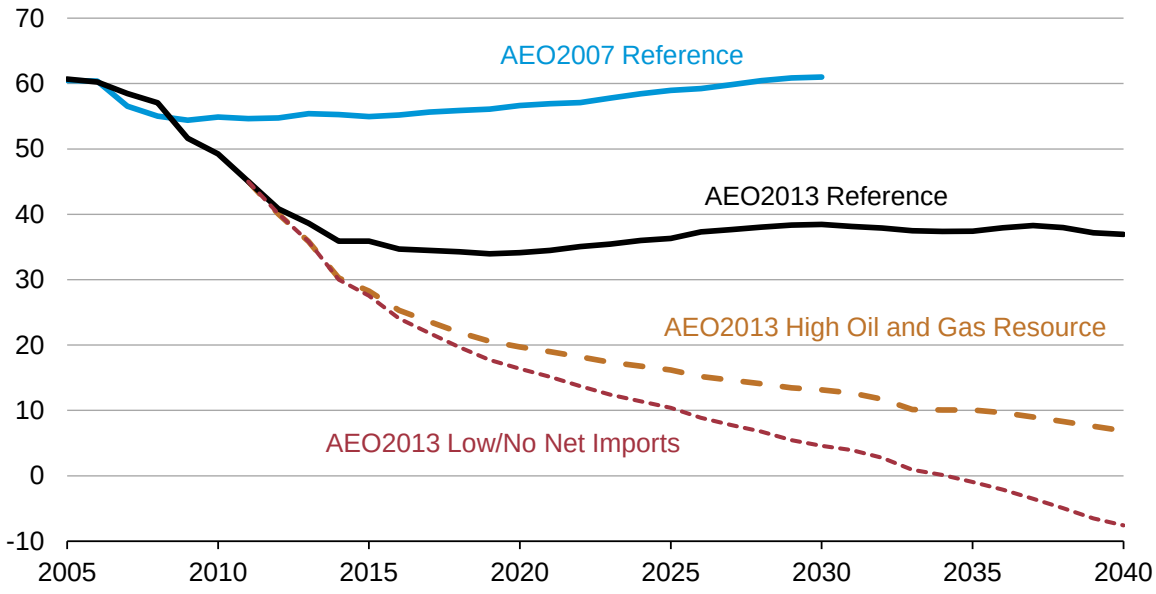



*Source: EIA, Annual Energy Outlook 2007, Annual Energy Outlook 2010, Annual Energy Outlook 2013*

7. **Projected reliance on oil imports in AEO2013 (Figure 4) is significantly below the AEO2007 Reference case projection. Recent and projected reductions in net import dependence primarily reflect the combined effects of the significant lowering in projected petroleum demand growth, as**

**discussed previously, and a more robust outlook for domestic petroleum production. Biofuels volumes in response to the RFS program play only a small part in reducing projected net import dependence given the expectation of continued use of ethanol as an octane and volume enhancer independent of RFS program requirements**. EIA expects that net dependence on imported liquid fuels, which declined from 61 percent in 2005 to 41 percent in 2012, will average only 30 percent in 2014. The recent rapid growth in tight oil production, which in 2012 represented 29 percent of total U.S. crude oil production, has been particularly noteworthy. Figure 4 shows actual and projected net import shares from three AEO2013 cases as well as the AEO2007 Reference case.

Figure 4. Net import share of liquid fuels, 2005-2040




*Source: EIA, Annual Energy Outlook 2007, Annual Energy Outlook 2013, Short Term Energy Outlook May 2013*

8. **The present challenges facing the RFS program are reflected in the value of Renewable Identification Numbers (RINs) that are used by EPA to implement the RFS.** EPA has created several

different varieties of RINs that correspond to the nested targets for different categories of biofuels in the RFS. The price of RINs which can only be used to satisfy the total RFS mandate (D6 RINs) hovered close to zero through 2012, as the use of ethanol as an octane enhancer and volume enhancer, as previously discussed in my testimony, was more than sufficient for obligated parties to comply with the RFS program. Early this year, D6 RIN prices rose dramatically as the market reflected on the difficulty in meeting a rising RFS target given the difficulty of accommodating additional ethanol volumes within E10 gasoline. Since mid-March, the price of D6 (ethanol) RINs has closely tracked the price of D4 (biodiesel) RINs that can be used to meet the RFS targets for advanced biofuels and biodiesel as well as the overall target.

The increase in the D6 RIN price provides an economic incentive for two changes in the market. First, a higher D6 RIN price tends to lower the cost of E85 gasoline relative to E10 gasoline. Second, a D6 RIN price equal to or near the biodiesel RIN price may motivate blending of biodiesel that exceeds the biodiesel blending requirements that EPA announced in its proposed rulemaking for the 2013 RFS program that has yet to be finalized.

At the retail level, EIA expects diesel fuel prices to be most affected by higher RIN prices as typical biodiesel blending yields only about one-third of the RINs required and diesel fuel refiners who are obligated parties under the RFS program must make up for the shortfall by purchasing the now higher-priced RINs.

9. **EIA remains actively engaged in matters related to the RFS program. We collect monthly data on biodiesel and ethanol production, as well as weekly and monthly data on ethanol blending**. Last

fall, we published a report, *Biofuels Issues and Trends* (available at http://www.eia.gov/biofuels/issuestrends/pdf/bit.pdf) to provide an overview of the dynamics of production, consumption, and trade of ethanol, biodiesel, and cellulosic biofuels. This report provided a snapshot of the available data related to biofuels, examined significant cost drivers, reviewed state and federal regulatory environments, and explored select infrastructure issues. Each October, as required by law, EIA provides input to EPA on short-term forecasts for motor fuels use and cellulosic biofuels production. Recently, at EPA's request, we provided updated forecasts for 2013. EIA includes biofuels as part of its Annual Energy Outlook, Short-Term Energy Outlook, and has also published several Today in Energy and This Week in Petroleum articles on the subject.

Over the last year, EIA held two workshops to engage the professional and academic communities on issues relating to biofuels projections. In August 2012, EIA held a workshop on advanced biofuels, which brought together around 90 representatives from government, national labs, research institutions, commercial biofuels producers, universities, non-profit organizations, and investment firms, so that they could share with us some of the opportunities and challenges of commercializing advanced biofuels technologies. Informed by the lessons learned in the first workshop, EIA produced its AEO2013 early release in January. In March, we hosted a second workshop attended by over 200 people, over half via a live internet feed, to discuss results and solicit feedback on a variety of biofuels-related topics in preparation for future analysis.

Thank you for the opportunity to testify before the Subcommittee.