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Testimony

before

U.S. Senate Committee on Environment and Public Works

“Oversight of the Renewable Fuel Standard”

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Submitted by:

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Chairman Inhofe, Ranking Member Boxer and members of the Senate Committee on Environment and Public Works, I want thank you for the opportunity to testify on the Renewable Fuel Standard (RFS) and the U.S. Environmental Protection Agency's (EPA) management of this program.

I am president of the Energy Policy Research Foundation, Inc. (EPRINC). EPRINC was founded in 1944 and is a not-for-profit organization that studies energy economics with special emphasis on petroleum and the downstream product markets. EPRINC researches and publishes reports on all aspects of the petroleum markets which are made available free of charge to interested organizations and individuals. We are recognized internationally for providing objective analysis of energy issues.

EPRINC has undertaken research and analysis on ethanol's role in the transportation fuels sector since 2006, including a major workshop with the Energy Information Administration (EIA) as far back as 2008. From assessments starting in 2006, we have concluded that the principal drawback and risk factor of the program is not the use of ethanol (and other biofuels) as a blendstock for gasoline and diesel fuel, but the statutory mandate which requires ever-larger blending volumes without regard to market conditions, costs or technical constraints. Our assessments conclude that the price risks to consumers from higher transportation fuel costs rise considerably as blending of biofuels exceeds 10 percent of the gasoline pool, which is commonly referred to as the blendwall.

My testimony today includes (i) a brief historical background on the biofuel mandate, (ii) why the initial rationale for setting biofuel mandates is no longer relevant in light of the North American Petroleum Renaissance, (iii) an assessment of the price risks from biofuel blending requirements under the RFS, and (iv) the importance of moving forward with reforming the program in a manner that recognizes the full integration of corn ethanol as an important blendstock in the production of gasoline and proceeding with a more cost-effective policy for bringing advanced biofuels into the transportation fuels sector. Of special concern is how to proceed with the program without creating risks of price spikes in transportation fuels for American consumers.

Introduction

Biofuels have long been used as blending components in U.S. transportation fuels to meet a wide variety of fuel specification and environmental requirements.¹ Prior to the recent resurgence in domestic oil and natural gas production, concerns about the U.S.' increasing dependence on imported oil led to the passage of both the Energy Policy Act of 2005 (EPA05) and the Energy Independence and Security Act of 2007 (EISA). These laws established a broad program to blend renewable fuels into the domestic transportation fuel (gasoline and diesel) pools. These minimum volumes of ethanol and biomass-based diesel (biodiesel) were mandated to rise each year through 2022. At the time that the legislation was enacted, the blending requirements were viewed as being well below the bounds where they would create adverse operational effects. Furthermore, the RFS program was supposed to provide a cost effective program to reduce petroleum imports as well as provide environmental benefits from a lower carbon fuel.²

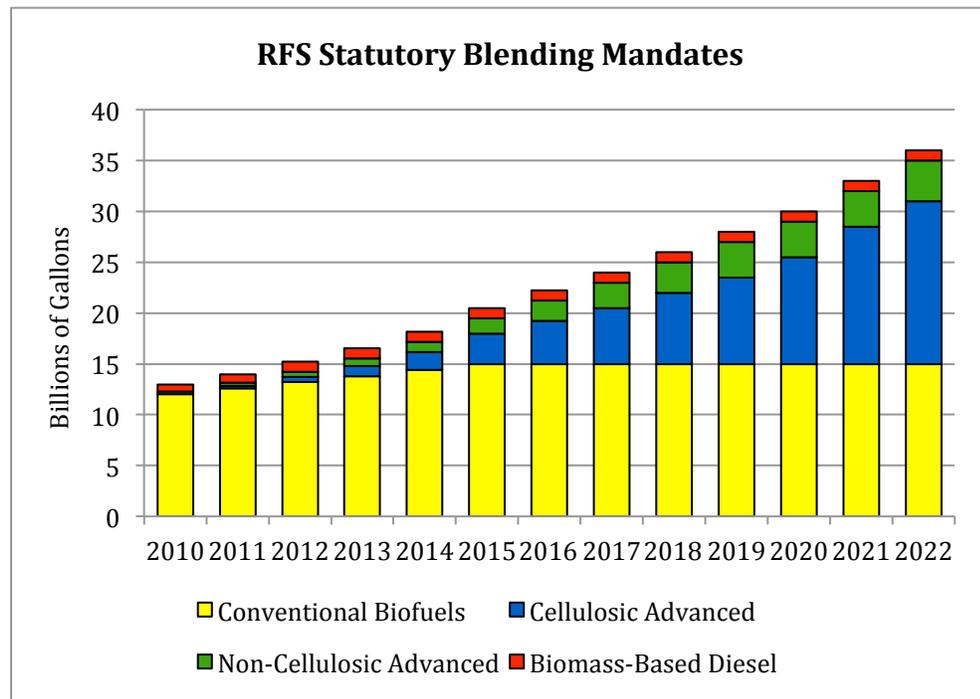
EISA requires an increasingly aggressive program each year for blending biofuels with petroleum based transportation fuels. Specifically, ethanol is blended into gasoline, and biodiesel is blended into diesel. These volumetric targets began in 2006 at a total of 260,000 barrels/day (4 billion gallons per year), and are mandated to rise to 2.35 million barrels/day (MBD) or 36 BGY in 2022 (see Figure 1). Under the statute, EISA is required to estimate gasoline and diesel consumption ahead of time, and then set percentage targets for renewable fuels for refiners to blend into transportation fuels. However, EPA has not issued the volumetric requirements on a timely basis in recent years as the introduction of higher volumes of biofuels into transportation

¹ For a full discussion of fuel specifications, cost considerations, and regulatory requirements for manufacturing gasoline, see Pugliaresi, L., & Pyziur, M. (June 2015). *Gasoline Blending An EPRINC Primer*. <http://eprinc.org/wp-content/uploads/2015/06/Updated-Gasoline-Primer-2015.pdf>

² There is considerable debate on whether ethanol provides substantial environmental benefits from reduced GHG emissions. When new land is brought into production lifecycle GHG emissions can increase. When these so-called indirect land use effects are ignored, ethanol can sometimes lower GHG emissions, but it can also add to deterioration in local air pollution. See Christopher W. Tessum, Jason D. Hill, and Julian D. Marshall, *Life cycle air quality impacts of conventional and alternative light-duty transportation in the United States*. Proceedings of the National Academy of Sciences. See www.pnas.org/content/111/52/18490.full.pdf+html. December 30, 2014.

fuels has come against technical and cost constraints. A major problem with the program is that meeting the volumetric targets is likely to become

Figure 1



increasingly difficult (and costly) because of technological constraints and consumer resistance to ethanol blends into the gasoline pool at percentages higher than 10%; this limitation is commonly known as the “blendwall.” A large percentage of the gasoline-powered fleet cannot accept fuel with more than 10% ethanol without damaging engines and U.S. law generally has prohibited such higher blends. Diesel-powered vehicles also have constraints on the amount of biodiesel that can be blended into the petroleum-derived counterpart. Generally, manufacturers recommend to not exceed 5% biodiesel/diesel blends.

The RFS program is administered by requiring all refiners and importers (collectively known under the legislation as Obligated Parties) to document that they have acquired RINs (renewable identification numbers). In turn, these RINs are then acquired from biofuel producers by Obligated Parties registered with EPA, usually, when biofuels are blended into gasoline or diesel. In recent years, the biofuel mandate, or RFS, could be met with ethanol blends below 10% of the

gasoline pool. Refiners and other Obligated Parties could, however, blend above their mandated requirement and then retain those extra RINs for sale to Obligated Parties who had not met their volumetric mandates or bank them for use in the following year.

In recent years, EPA has struggled with the program and has been consistently late in setting the blending requirements for so-called obligated parties. EPA's latest biofuel blending requirements recognizes that the statutory mandates for "advanced biofuel" and "total renewable fuel" cannot be achieved in 2014, 2015, and 2016. Accordingly, the agency exercised its discretion under two waiver provisions of the enabling statute to reduce the applicable volumes. The volumetric levels established reflect EPA's view that the final rule (a) cannot have an impact on the amount of renewable fuel used in the past (2014 and most of 2015); and (b) should address constraints on the supply of renewable fuels. These constraints relate to (i) limitations in production or importation of these fuels, and (ii) difficulties supplying such fuels to vehicles that can consume them. However, EPA makes clear that the final volumetric requirements are intended to incentivize significant growth in renewable fuel use beyond what would occur in the absence of such requirements. EPA states, "the final volumes recognize the ability of the market to respond to the standards we set while staying within the limits of feasibility."

EPA goes on to say that while there is little or no legislative history accompanying the authorizing statute, it is reasonable to assume that, by setting such ambitious standards, Congress intended to drive substantial market changes in a relatively short period of time. Congress did not explicitly indicate the sort of changes that were necessary to reach the mandate of 36 billion gallons by 2022. However, the EPA states that there is various possible approaches to expanding use of renewable fuels significantly, including:

- *Increase the use of E15*
- *Increase the use of E85 in flex-fuel vehicles*
- *Increase production and/or importation of non-ethanol biofuels (e.g. biodiesel, renewable diesel, renewable gasoline, and butanol) for use in conventional vehicles and engines*
- *Increase the use of biogas in CNG vehicles*
- *Increase the use of renewable jet fuel and heating oil*

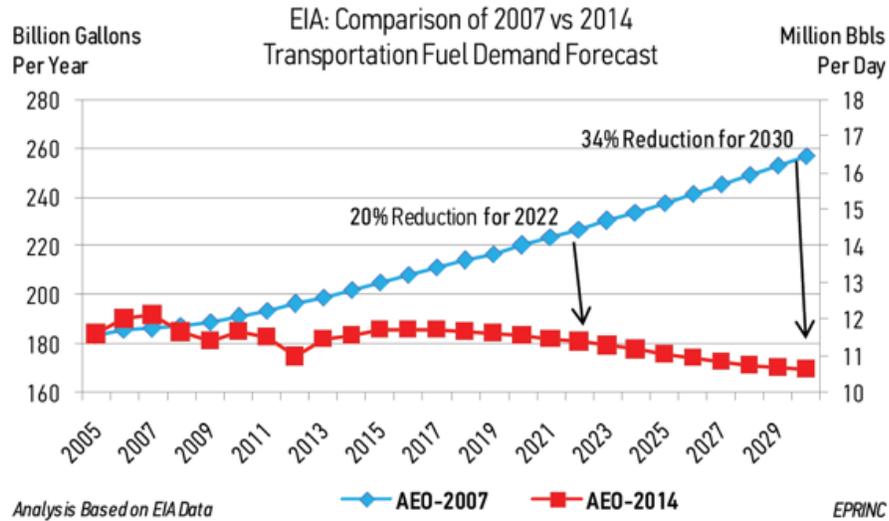
- *Increase the use of cellulosic and other non-food based feedstocks, and cooperative development of new technology vehicles and engines optimized for new fuels*

EPA further explains that in the near term, it expects that increases in E85 and biodiesel will dominate efforts to increase the use of renewable fuels, with smaller roles played by other renewable fuels such as E15 and several non-ethanol renewable fuels. In the longer term, EPA believes that sustained increases in volume requirements are necessary to provide the certainty of a guaranteed future market for investors in new products and technology. Accordingly, EPA repeatedly states that it will set the standards, consistent with Congressional intent, to increase the use of renewable fuel over time. Moreover, it will only use its statutory waiver authority to the degree necessary to maintain a viable and workable program.

Changing Market Conditions

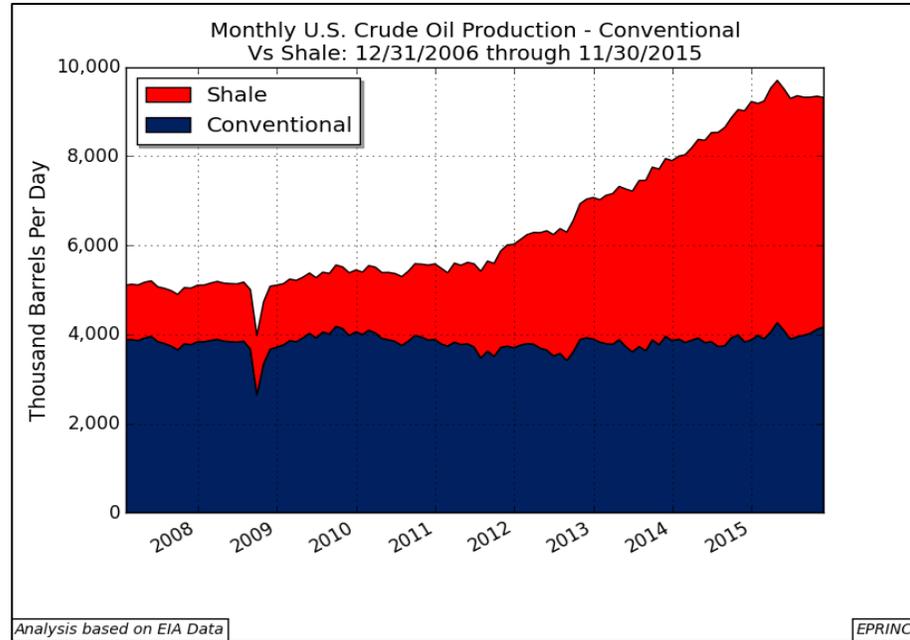
There are two fundamental shifts in U.S. petroleum outlook that have changed dramatically since EISA became law. The first is U.S. consumption of transportation fuels has declined instead of increased, and EIA forecasts that demand for these fuels will continue this decline in the coming years. The reductions are considerable. In 2014, U.S. gasoline consumption was approximately 8.9 million barrels/day (MBD), 4% less than the U.S. record high consumed in 2007. These new expectations are shown in Figure 2 and were clearly not a future considered by the Congress when setting the blending requirements in 2007.

Figure 2



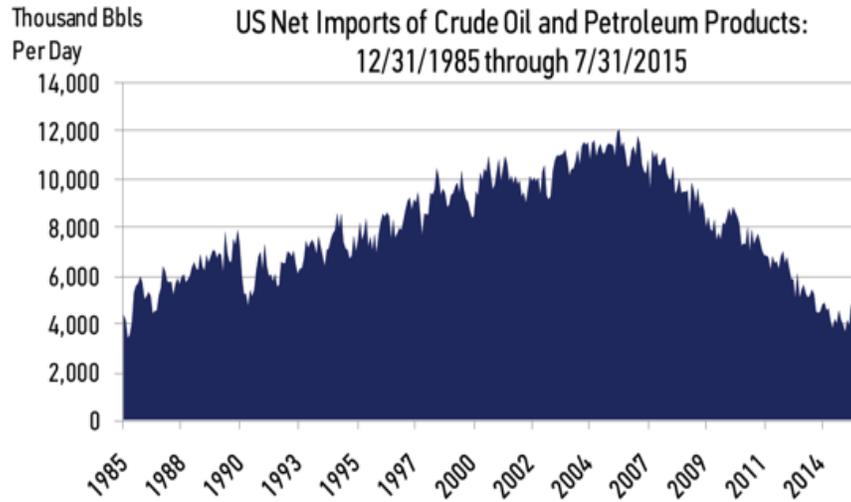
The other important change from 2007 is the remarkable expansion of domestic oil production from the technological revolution in exploration and production of crude oil from unconventional petroleum resources. The surge in crude oil production in the U.S., rising from 5 MBD in 2008 to over 9.5 MBD by mid-2015 (shown in Figure 3), has been a remarkable achievement of technological innovation and risk-taking in a province most analysts had suspected was undergoing permanent decline.

Figure 3



The U.S. now sits alongside Russia and Saudi Arabia as one of the world’s largest producers of both oil and natural gas. These domestic unconventional petroleum developments are altering flows in world crude oil trade, shifting long-term price expectations, and challenging the long-held conventional wisdom on U.S. energy policy that was promulgated in an era of scarcity. After being written off as a petroleum province in permanent decline, the surge in U.S. production has not only reduced U.S. net imports, it has also been a major force in bringing down world oil prices. Most remarkable has been the decline in U.S. net imports of crude oil and petroleum produces from an average high of 11.4 MBD in 2005 to 4.3 MBD in 2014 (see Figure 4). Notably in this new environment, nearly 75% of the 4.3 MBD of U.S. net imports are provided by Canada.

Figure 4

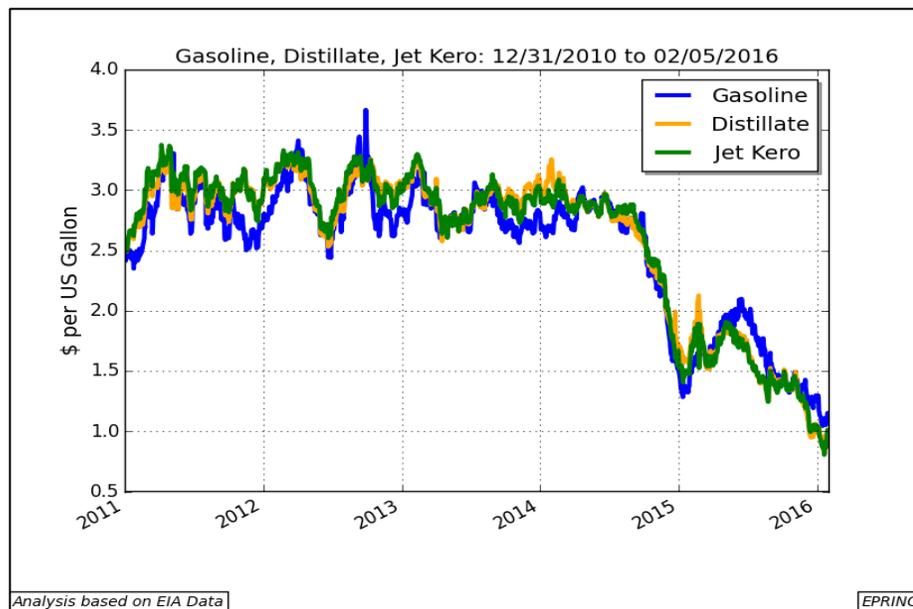


Analysis Based on EIA Data

EPRINC

Although a large array of forces are at play in driving down world oil prices, a major contributor to the recent fall in prices has been the rapid acceleration of American crude oil production. Figure 5 shows the consequences of the price collapse in wholesale prices of gasoline, distillate (diesel) and jet fuel.

Figure 5
Recent Price Changes in Transportations Fuels



Analysis based on EIA Data

EPRINC

These lower prices have provided enormous savings to consumers and throughout the national economy.

Price Risks to Consumers

A key feature of the biofuel program is that as Obligated Parties are required to increase mandated biofuels above the blendwall, it becomes more likely that the mandates in the RFS will limit compliance options to a narrower set of high-cost strategies with subsequent, elevated risks of price spikes in the cost of transportation fuels. The compliance program in the RFS operates under a general rule where Obligated Parties must fulfill each category of the RVO as well as the overall mandate. The RFS consists of categories corresponding to the different biofuel types. Compliance is complete when sufficient credits are obtained for each category, and sum to a targeted, required amount. RIN credits that are obtained in excess from blending the more advanced, expensive biofuels can be applied to fulfill compliance in the less advanced biofuel categories. However, the reverse is not allowed: excess credits from a less advanced biofuel cannot be applied to fulfill requirements in a more advanced biofuel category. For example, any renewable fuel that meets the requirement for cellulosic biofuels or biomass-based diesel (BBD) is also valid for meeting the advanced biofuels requirement. Thus, if any combination of cellulosic biofuels or BBD were to exceed their individual mandates, the surplus volume would count against the advanced biofuels mandate, thereby reducing the potential need for imported sugar-cane ethanol or other fuels to meet the unspecified portion of the advanced biofuels mandate.

Furthermore, any renewable fuel that meets the requirement for advanced biofuels is also valid for meeting the overall total renewable fuel requirement (which grows to 36 BGY by 2022). As a result, any combination of cellulosic biofuels, BBD, or imported sugarcane ethanol that exceeds the advanced biofuel mandate would reduce the potential need for corn-derived ethanol to meet the overall mandate.

The program does not permit covering the advanced requirements by using larger volumes of E85 or other corn-based biofuels. So Obligated Parties must meet both the overall RVO and also the individual categories, with the exception that exceeding the targets in the more advanced

categories can be pushed to down to cover a lower category. By selecting a likely least-cost compliance, the RFS mandate fulfillment is initially done with those biofuel sources that exhibit some combination of lower cost and/or ease of implementation. To date, this has been primarily done through corn-based ethanol.

As discussed above, there are also specific biodiesel and cellulosic biofuel requirements. Once the blendwall is crossed, E10 is no longer an alternative for meeting the RFS mandate and Obligated Parties must seek other options to meet the provisions of the biofuel program. Refiners can meet part of their overall RVO targets by using more E85 or E15, but these may not be available due to high consumer resistance. At that point Obligated Parties must seek some combination of higher volumes of biodiesel and cellulosic ethanol, export production which was originally targeted for domestic markets, or cut production. Refined products manufactured in the U.S. and sold into foreign markets do not require biofuel blending or RIN purchases. Looking forward, least-cost RFS compliance strategies, are made with considerable uncertainty, and present substantial risks for price escalation for transportation fuels. Transportation fuels are essentially commodities with little perceptible branding distinctiveness. Therefore, their prices reflect their costs of production. If a combination in part or all of the following occurs,

- *gasoline demand decreases in excess of EIA/EPA forecasts,*
- *corn or soy bean costs rise,*
- *crude feedstock prices decline,*
- *E85 consumer purchase resistance remains, or*
- *E0 sales rise (or EPA underestimates the size of the E0 market),*

RFS compliance will substantially raise both gasoline and diesel prices. For consumers, the costs are uncertain and present high price risks because the biofuel mandate prohibits a range of low-cost measures to meet domestic gasoline and diesel demand once the blendwall is crossed.

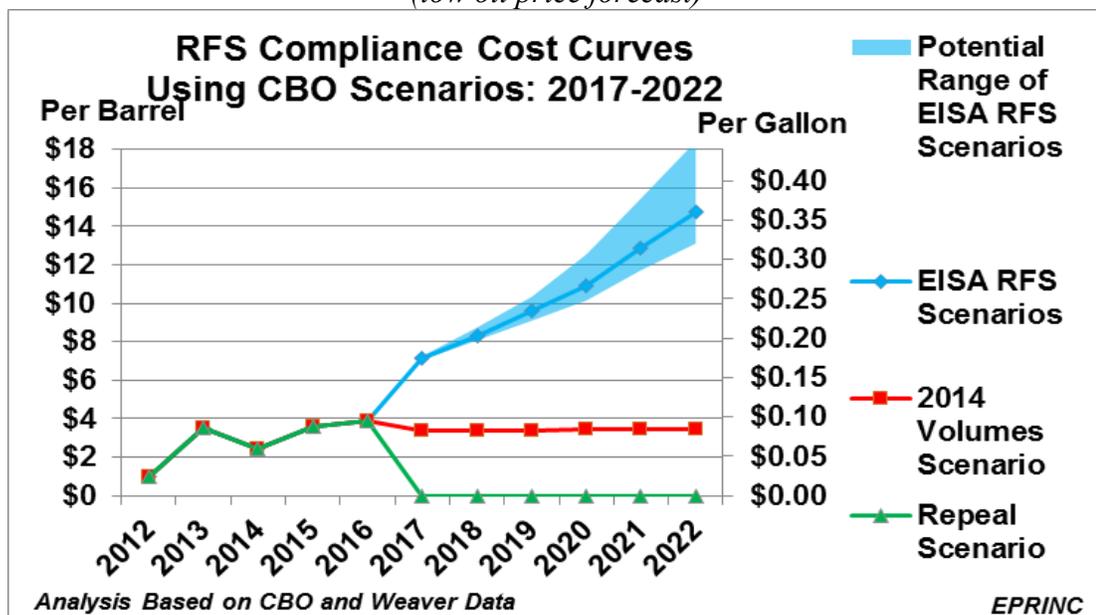
Ultimately, EPA's decision on where to set the volumetric targets contributes to the price risk for transportation fuels.³ Many proponents of the mandate recommend that Obligated Parties

³ *EPRINC estimates direct compliance estimates using a static analysis. However, if the RFS program moves prices up substantially, demand will fall, requiring larger percentages of biofuels blended into gasoline and diesel fuels, further aggravating prices.*

meet the RVO by increasing sales of E85. The only vehicles that can use E85 are so-called FFVs (flex fuel vehicles). Such an alternative requires considerable investment by gas station owners and other participants in the E85 value chain. Other alternative fuel technologies (CNG, LPG, among others) are options, but these have also remained limited due to cost considerations, logistics constraints, and consumer resistance. For E10, there were no changes required to existing vehicles, and filling stations require minimal adjustments in the form of certain seal, gasket, and filter replacements. Adoption of E10 impacted terminals the most, requiring new tanks, and delivery, rack, and blending equipment. E85 requires significant changes not only to terminals but also to filling stations and vehicles. Both E85 and biodiesel are very high cost strategies for meeting RVOs that exceed the blendwall.

Modeling a range of likely compliance cost alternatives from 2017 to 2022 and viewing the scenario with the adoption of the RFS mandate as outlined in EISA, EPRINC’s calculations forecasts that RVO obligations would increase gasoline prices from approximately 30 cents to 50 cents a gallon (shown in Figure 6) above prices that would prevail in a market without volumetric mandates. This cost

Figure 6
(low oil price forecast)



escalation is higher than in our earlier forecasts because we are entering into a market with lower gasoline prices, and in a low gasoline price environment for transportation fuels, volumetric mandates that exceed the blendwall are likely to be more costly. Only the Repeal Scenario would prevent the mandates from increasing gasoline prices, and even holding mandated volumes at 2014 would yield an increase of approximately 10 cents a gallon. Other than the cost of crude oil, EPA's RVO targets will now be the primary factor in setting the price of gasoline.

EPRINC's assessment demonstrates that the RIN compliance program of the RFS creates substantial long-term costs, risks, and uncertainties to consumers and Obligated Parties. These technical constraints and cost risks have been and continue to be largely borne by U.S. motorists and companies reliant upon the nation's two primary transportation fuels: gasoline and diesel. The cost risks to the program escalate substantially as blending volumes exceed the 10% of the gasoline pool and are exacerbated by low gasoline prices. EPA has previously recognized these risks, and it has used its authority to set mandated blending volumes below targets established by the original statutes. Although this recognition by EPA that the blendwall, as well as other parts of the program, present technical constraints, the agency has nevertheless stated that it intends to continue to raise annual volumetric targets and undertake an ambitious effort to do so.

The fundamental problem with the program is that the mandate for biofuel blending severely restricts, and sometimes eliminates lower cost compliance options among Obligated Parties to changes in either the cost of biofuels or the cost of complying with the regulation. Compliance options narrow considerably as:

- mandated volumes exceed 10% of the gasoline pool;
- larger volumes are required for blending biofuel into diesel; and
- expanded volumes are required for so-called advanced biofuels.

These uncertainties and cost/price risks include not only operational impediments such as the minimal and consumer-resistant adoption of more FFVs (that actually use E85), but a range of binding constraints that restrict routine adjustments to market signals (changes in corn prices, biodiesel costs, technical limitations on volumes of advanced biofuels, consumer demand, etc.). The availability of lower cost compliance options become so challenging under some EPA

mandated high volumetric scenarios that Obligated Parties only alternative is to reduce supply to motorists and further increase prices.

Program Reform

The U.S. biofuel program is now really two programs, blendstock produced from corn ethanol, which is a well-integrated (nearly all U.S. gasoline is E10) blending component for the production of gasoline (at levels of 10% and below), and everything else. Today, E10 is sold in every state and more than 95% of U.S. gasoline contains up to 10% ethanol to boost octane and meet air quality requirements. Corn ethanol is a mature and competitive industry. In 2015 the U.S. ethanol industry was sufficiently competitive to export over 800 million gallons to international markets, and even in a regulatory environment free of mandates would still provide roughly the same volume of blendstock consumed by the petroleum industry as has prevailed in recent years. Ethanol producers would unlikely see any substantial reduction in sales volume below 10% of U.S. gasoline demand even in a full repeal scenario. Ethanol is an important and critical blendstock for the production of gasoline. The problem with the program is not ethanol, but the mandate which prohibits normal market adjustments to price fluctuations and poses ongoing price risks to consumers.

Many of the remaining technologies in the biofuel industry are uneconomic either because they are too costly to produce or are technically constrained by blending volumes above 10 percent. Given the maturity of the domestic ethanol industry it can clearly prosper without a mandate. The question is finding an appropriate implementation strategy for the more expensive cellulosic and other advanced biofuels. Traditionally, government programs have not sought to mandate costly or unproven technologies into the marketplace over concerns that consumers would face rising prices. We should now recognize that we are in an era of energy abundance and that other strategies, e.g., research support or tax credits, are a more cost effective policy to protect consumers instead of mandates.

As we look back on U.S. energy legislation policies since the 1970s, we cannot help but be stunned by the systematic failure to predict the future and the unintended consequences of U.S. energy policy. Often these policies, in an attempt to either promote the development of

alternatives to petroleum or to insulate consumers from price volatility, prevented more productive responses from both consumers and producers. Price controls implemented in response to a 6 month Arab oil embargo in 1973 resulted in over ten years of sustained misallocation of resources, limited the cost-effective development of U.S. petroleum resources, and brought about the proliferation of dozens of small inefficient refiners. In the late 1970s, in response to concerns we were running out of natural gas, we banned its use in electric power generation throughout the national economy. These policies were implemented through the Powerplant and Industrial Fuel Use Act of 1978, which encouraged the use of coal, nuclear energy, and other alternative fuels under the assumption that natural gas production was in permanent decline. We no longer have a government run Synfuels Corporation (initiated in the late 1970s) because it became too costly in the 1980s. I am sure it is lost on none of us how peculiar and counter-productive these programs seem today and these experiences of the past should provide guidance in reforming mandates for biofuel blending into transportation fuels.

Finally, there is a much larger concern for the Congress to address, and that is the risk to economic recovery. Lower gasoline prices are yielding annual savings for the U.S. economy of \$129 billion, or an estimated \$1000 per year per household. These savings to consumers are essential for expanding economic growth, particularly in light of the enormous losses we are seeing from rapid cuts in capital investment in domestic oil and gas development. The oil producing regions of the U.S. are experiencing enormous pain from the decline in oil and gas development. Historically, this pain has been compensated by savings to consumers and subsequent economic expansion. Great care should be taken to ensure that these savings are not lost through a regulatory program that increases gasoline prices (which was never an expected outcome of the program when Congress established the RFS). At a minimum we should only proceed if we have a clear understanding of both the incremental benefits of the program and economic risks associated with higher gasoline prices.