RENEWABLE FUELS ASSOCIATION

June 21, 2013

The Honorable Fred Upton
Chairman
Committee on Energy and Commerce
U.S. House of Representatives

The Honorable Henry Waxman
Ranking Member
Committee on Energy and Commerce
U.S. House of Representatives

Dear Chairman Upton and Ranking Member Waxman:

The Renewable Fuels Association (RFA) is the national trade association representing the U.S. ethanol industry. The RFA appreciates the opportunity to respond to the questions posed in the fourth white paper, "Energy Policy," as part of the Committee's review of the Renewable Fuel Standard (RFS).

As noted in the Committee's white paper, U.S. dependence on imported oil and petroleum products has fallen in recent years. According to Energy Information Administration (EIA) data, the share of U.S. petroleum consumption represented by imports has fallen steadily from 60% in 2005 to 40% today. It is important to note that this measure includes net imports of both crude oil *and* all other petroleum products. If just crude oil is considered, import dependence was 57% in 2012, meaning that the most significant reduction has been in petroleum products, i.e., finished gasoline. While several factors are responsible for the decrease in petroleum import dependence in recent years, the rapid emergence of ethanol production under the RFS stands out as a particularly important catalyst, largely eliminating the need for imported finished gasoline. Indeed, EIA cites "increased use of domestic biofuels (ethanol and biodiesel)" as a major driver behind the decrease in petroleum import dependence.[1] In fact, cumulative new ethanol production since 2005 has accounted for 62% of new domestically-produced liquid fuels, while cumulative new U.S. crude oil production has accounted for 38%.

While increased domestic oil production from fracking has also been a factor in reducing petroleum import dependence from 2005 levels, its role has been exaggerated by oil and gas proponents. Oil production from fracking is a relatively recent phenomenon, and U.S. oil production was actually declining steadily until 2009. Further, the scale of technically recoverable crude oil from U.S. shale resources needs to be placed in context. The 4.3 billion barrels of technically recoverable tight oil from the Bakken shale play (as estimated by the U.S. Geological Survey) is less than one year's worth of crude oil consumption by U.S. refineries (U.S. refiner input of crude oil was 5.5 billion barrels in 2012).

[1] http://www.eia.gov/energy_in_brief/article/foreign_oil_dependence.cfm

In any case, the recent boom in tight oil production from fracking doesn't change the fact that fossil fuels are finite and exhaustible. The fracking boom has simply delayed the inevitable. Referring to the recent developments in U.S. unconventional oil production, a recent paper published in *Energy Policy* concluded:

> However important these developments are, they do not change the central argument of Peak Oil…Rather than continuing to argue for or against the topic, Peak Oil should be acknowledged as part of a complex energy situation with the realization that cheap fuel is no longer available and we now face circumstances where prices will increase and high energy-based growth will be limited. With this acceptance, and while there still is sufficient oil, *there should be investment in new energy source*s (emphasis added).[2]

One new energy source — ethanol — is already making a difference. Because of the RFS, ethanol already accounts for 10% of the nation's gasoline supply. Because of the RFS, ethanol displaced the need for the amount of gasoline refined from 462 million barrels of imported crude oil in 2012.[3] Because of the RFS, the biofuels industry stands ready to contribute substantially more to our nation's energy and economic security.

Below please find RFA's responses to the specific questions set forth by the Committee on energy policy impacts.

1. **How vulnerable is the United States currently to major oil supply and price disruptions? In the context of rising domestic oil production and falling demand, how important is it to adopt new and strengthen existing policy measures to further reduce our dependence on oil?**

Because the oil market is global in nature, and because the United States constitutes a relatively small share of world production, the U.S. economy remains highly vulnerable to oil supply and price disruptions. While domestic oil production has increased in recent years, the U.S. accounted for just 8.6% of world crude oil production in 2012.[4] By comparison, OPEC nations produced 43% of the world's crude oil in 2012, and the Middle East region specifically accounted for 32%. Notably, U.S. crude oil imports from the Persian Gulf region hit a four-year high in 2012, while imports from the Gulf nations of Iraq and Saudi Arabia reached their highest levels since 2008.

Meanwhile, the United States continues to lead the world in the consumption of oil and petroleum products. The United States accounted for 21% of global petroleum use last year, nearly double the

[2] Chapman, I., The end of Peak Oil? Why this topic is still relevant despite recent denials. Energy Policy (2013), http://dx.doi.org/10.1016/j.enpol.2013.05.010

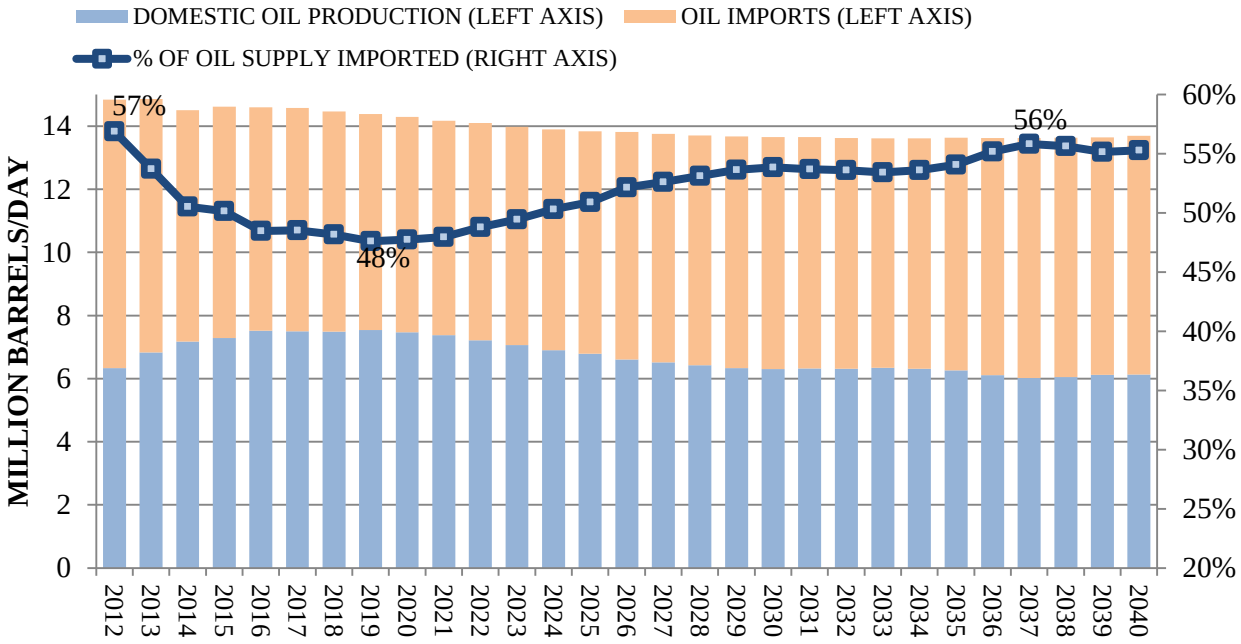
[3] 2012 ethanol production totaled 317 million barrels. 214 million barrels of gasoline would be needed to replace the energy found in 317 million barrels of ethanol. 462 million barrels of crude oil are needed to refine 214 million barrels of gasoline.

[4] U.S. production of crude oil (including lease condensate) in 2012 was 6,505 thousand barrels per day (tbpd), while global production was 75,582 tbpd. Energy Information Administration, International Energy Statistics: Production of Crude Oil (including lease condensate). http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm

amount consumed by China.[5] In fact, the U.S. used 67% more oil and petroleum products than it produced in 2012. Despite the potential for increased domestic oil production through 2020, EIA projections show the United States remaining heavily dependent on crude oil imports in the long term.[6] According to EIA projections, oil imports account for more than 50% of total crude oil supply through 2015, then drop to a low of 47.6% in 2019, then rebound to the 50-56% range in 2024-2040 (Figure 1). As stated recently by Hampshire College Professor Michael Klare in *The Nation*:

> While output from unconventional oil operations in the United States and Canada is likely to show some growth in the years ahead, there is no "golden age" on the horizon, only various kinds of potentially disastrous scenarios. Those…who claim that the United States can achieve energy "independence" by 2020 or any other near-term date are only fooling themselves, and perhaps some elements of the American public. They may indeed employ such claims to gain support for the rollback of what environmental protections exist against the exploitation of extreme energy, but the United States will remain dependent on Middle Eastern and African oil for the foreseeable future.[7]

FIGURE 1. U.S. CRUDE OIL PRODUCTION, CRUDE OIL IMPORTS, AND % OF CRUDE OIL SUPPLY IMPORTED (EIA AEO2013)



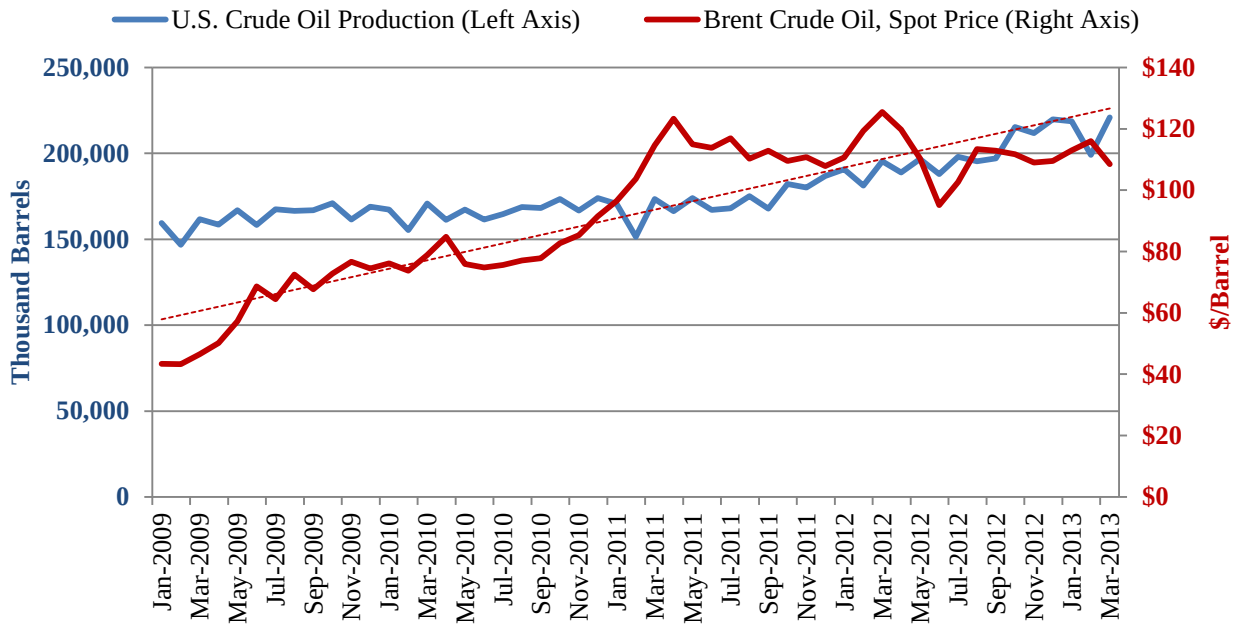
Source: EIA, Annual Energy Outlook 2013

Oil prices are determined at the global scale by a complex combination of economic, political and environmental factors. Supply shifts in a country that represents a fairly small share of global production

[5] Energy Information Administration, International Energy Statistics: Total Petroleum Consumption. http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm
[6] Energy Information Administration, Annual Energy Outlook 2013. http://www.eia.gov/forecasts/aeo/
[7] http://www.thenation.com/article/170353/new-golden-age-oil-wasnt#ixzz2WafzadV2

will not meaningfully influence world — or even domestic — prices. This can be seen by examining spot prices for Brent crude oil relative to U.S. oil production over the past four years (Figure 2). Brent crude oil prices have continued to trend higher since 2009 despite a considerable increase in U.S. production.

FIGURE 2. US CRUDE OIL PRODUCTION & BRENT CRUDE SPOT PRICE



The vulnerability of the United States to global oil price shocks is further underscored by the fact that Americans spent a record amount of disposable income on gasoline in 2012, despite domestic oil production reaching its highest level in 17 years. Indeed, an analysis of 36 years of monthly, inflation-adjusted gasoline prices and U.S. oil production by The Associated Press (AP) shows no statistical correlation between domestic production and the price at the pump. According to the AP:

> U.S. oil production is back to the same level it was in March 2003, when gas cost $2.10 per gallon when adjusted for inflation. But that's not what prices are now. That's because oil is a global commodity and U.S. production has only a tiny influence on supply. Factors far beyond the control of a nation or a president dictate the price of gasoline. …the United States alone does not have the power to change the supply-and-demand equation in the world oil market.[8]

Similarly, a recent report by the RAND Corporation entitled *Imported Oil and U.S. National Security* concluded that increases in U.S. oil production would have little or no effect on prices:

> …even if total U.S. imports were cut sharply, the price of oil in the United States would still be determined by global, not national, shifts in supply and demand. A large, extended reduction in the global supply of oil would trigger a sharp rise in the price of oil and lead

[8] http://www.guardian.co.uk/world/feedarticle/10154733

> to a sharp fall in economic output in the United States, no matter how much or how little oil the United States imports.[9]

Since oil prices are determined at the global level, and because the United States will continue to consume significantly more crude oil than it can produce, policies that encourage the domestic development and use of *alternatives* to fossil fuels remain critically important. Indeed, diversifying away from reliance on petroleum is the most effective means available for reducing prices and volatility in the U.S. fuel market. According to the RAND study:

> The United States would also benefit from policies that would push down the world market price of oil by curbing demand or increasing competitive supplies of oil, domestic and foreign, ***and alternative fuels***. U.S. terms of trade would improve, to the benefit of U.S. consumers; rogue oil exporters would have fewer funds at their disposal; and oil exporters that support Hamas and Hizballah would have less money to give these organizations (emphasis added).[10]

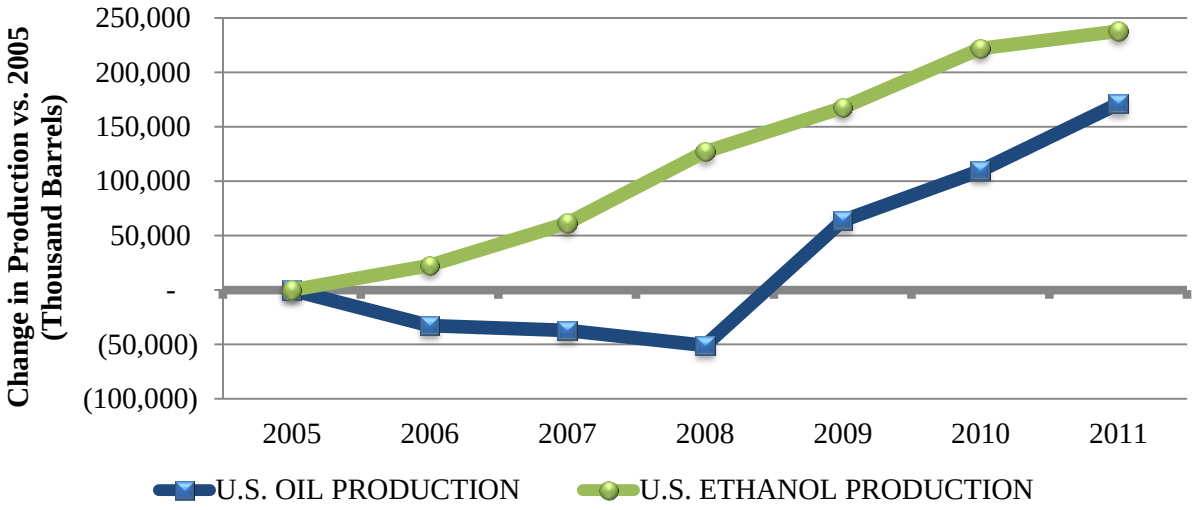
The RFS has worked as designed to increase competitive supplies of renewable alternatives to imported crude oil and to diversify the U.S. liquid transportation fuels marketplace. Already, ethanol use has grown to account for 10% of U.S. gasoline usage, significantly reducing demand for imported crude oil and finished gasoline.

2. How has the RFS contributed to improved energy security? To what degree should the reduction in U.S. oil imports be attributed to the RFS?

The RFS has unquestionably played a major role in reducing oil imports and enhancing energy security. U.S. oil import dependence (crude oil & petroleum products) peaked at 60% in 2005 and has fallen in every year since. The oil industry is quick to credit increased domestic production from fracking as the reason for falling import dependence since 2005. But it is important to remember that fracking is a relatively recent development and that U.S. production was actually *decreasing* until 2009 (see Figure 3).

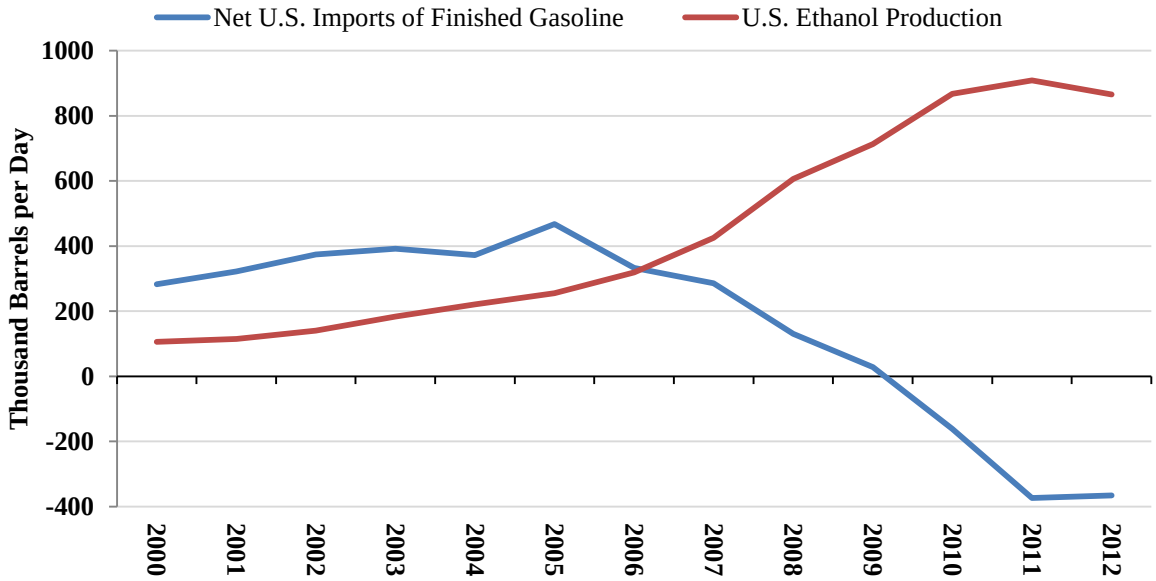
[9] http://www.rand.org/content/dam/rand/pubs/monographs/2009/RAND_MG838.pdf
[10] Ibid.

FIGURE 3. U.S. ETHANOL GROWTH COMPARED TO U.S. OIL GROWTH: ANNUAL CHANGE IN PRODUCTION VS. 2005 LEVELS



In fact, on a cumulative basis between 2005 and 2012 (i.e., accounting for annual gains *and* losses in production), ethanol has added significantly more volume to the U.S. liquid fuel supply than domestic crude oil. Cumulative new ethanol production since 2005 has accounted for 62% of new domestically-produced liquid fuels, while cumulative new U.S. crude oil production has accounted for 38%. In addition to displacing crude oil imports, the rise in ethanol production has eliminated the need for imports of finished gasoline (Figure 4). In fact, since 2010, the United States has been a net exporter of gasoline.

FIGURE 4. NET U.S. GASOLINE IMPORTS & ETHANOL PRODUCTION

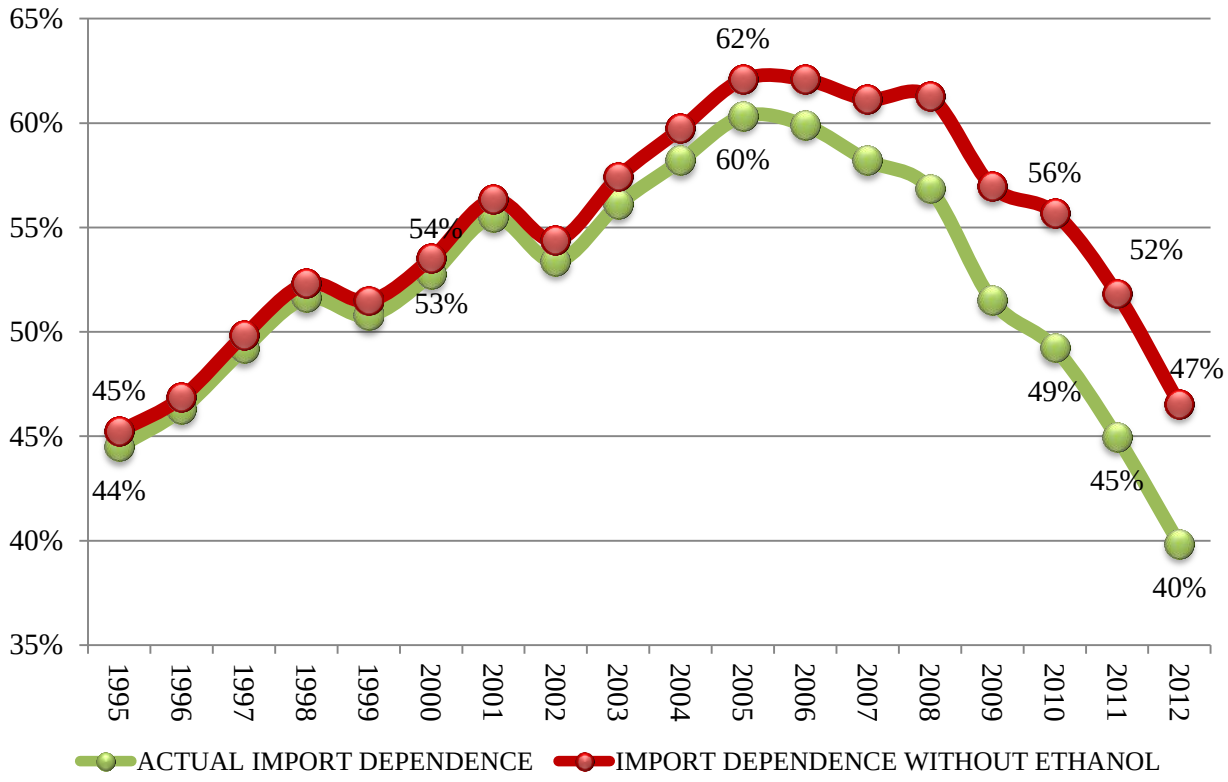


Improved fuel economy and reduced travel are frequently cited as reasons for reduced oil imports. While it is true that more fuel efficient vehicles have contributed to reduced gasoline consumption, this too has

been a fairly recent phenomenon. Additionally, after falling in 2008-09, total vehicle miles traveled have been stable in recent years.

While fuel efficiency standards, moderation in vehicle miles traveled, and recent increases in U.S. oil production all have played a role in reduced oil imports, the rapid expansion of ethanol has also been a critical factor. Under the RFS, 1.81 billion barrels (75.8 billion gallons) of ethanol have been added to the domestic gasoline supply since 2005, significantly curtailing demand for imported crude oil and finished gasoline. Without ethanol during this period, an additional 1.23 billion barrels of gasoline (and/or hydrocarbon octane sources) would have been needed to meet demand. To refine that amount of gasoline, 2.6 billion barrels of crude oil would have been needed (assuming 19.7 gallons of gasoline per barrel of crude oil). Thus, the RFS has had a tremendous impact on reducing imports of crude oil and finished gasoline. Figure 5 shows U.S. dependence on imported crude and petroleum products with and without ethanol production (the calculations underlying the chart assume 0.67 gallons of gasoline would be needed to replace every one gallon of ethanol; and 1.42 gallons of imported crude oil are needed to refine 0.67 gallons of gasoline). In recent years, import dependence would have been roughly 7 percentage points higher in the absence of ethanol.

FIGURE 5. U.S. OIL (CRUDE & PRODUCTS) IMPORT DEPENDENCE WITH AND WITHOUT ETHANOL



3. **In the context of rising domestic oil production and falling demand, to what extent does the RFS currently contribute to U.S. energy security and to what extent will it further contribute going forward?**

As indicated earlier, the United States will remain susceptible to the whims of the global oil market as long as petroleum serves as the primary energy source for transportation. While the share of the U.S. crude oil supply represented by imports is expected to dip slightly below 50% in the coming years, the country will remain heavily dependent on foreign suppliers (see Figure 1). This dependence will become even more acute if the United States reverses progress on renewable fuels or abandons the RFS. According to the RAND study, the U.S. economy will continue to be impacted by global oil markets "…no matter how much or how little oil the United States imports."

The only way to better insulate the U.S. economy from the vagaries of the world oil market is to meaningfully diversify the sources of energy used for transportation in the U.S. The greatest opportunity for energy security rests with fuel sources for which the United States exercises substantial market power. As the world's dominant leader in the production and consumption of biofuels, the United States exerts significant market power and influence over the behavior of the world biofuels marketplace.

4. **How do the costs and benefits of the RFS compare to those of other federal policies to diversify fuels used in the transportation sector, diversify transportation options, and reduce oil dependence through other means?**

The RFS is the *only* existing policy that accomplishes the multiple purposes of diversifying the transportation fuels market, reducing dependence on foreign oil, decreasing tailpipe pollutants and greenhouse gas emissions, and bolstering the rural economy. Importantly, these objectives are being accomplished at no cost to the U.S. taxpayer. We are unaware of any similar Federal policies that were designed with the same objectives in mind. While energy conservation policies such as fuel economy regulations can reduce oil consumption, they do not necessarily encourage diversification of transportation energy sources, nor do they provide the same broad economic stimulus to a wide array of U.S. industries.

In terms of net macroeconomic costs and benefits, a recent paper published by scientists at Oak Ridge National Laboratory found that implementation of the RFS results in resoundingly positive outcomes for American consumers.[11] The study found that full implementation of the RFS in 2022 results in U.S. gross domestic product being 0.8% higher than would have been the case without the RFS (for context, 0.8% of current GDP is approximately $120 billion). According to the authors, "The employment implications [of the RFS], measured by percentage changes in labor use, follow the same pattern as the GDP effects."

[11] Oladosu, D., et al. (2012). *Global economic effects of U.S. biofuel policy and the potential contribution from advanced biofuels.* Biofuels 3:6, 703-723.

5. What has been the impact of the RFS on oil prices? What has been the impact on gasoline and diesel fuel prices? What has been the impact on oil and fuel price volatility? How will these impacts change in the years ahead?

In modeling the impacts of implementation of the RFS2, researchers from Oak Ridge National Laboratory found, "[a]s expected, fossil energy prices, particularly oil, declined as biofuels replace increasing portions of liquid fuel use in the USA. The reduction in oil prices accelerated from -3% in 2015 to approximately -7% in 2022." This leads to reduced GDP in the Middle East and Africa, traditional oil exporting regions, the researchers found.[12]

Several analyses in recent years have estimated the impacts of increased ethanol blending on wholesale and/or retail gasoline prices. While the published estimates of ethanol's impact on gasoline prices vary, they are directionally consistent and all of the studies indicate that using ethanol does in fact result in meaningful savings at the pump. Estimates of the reduction in gasoline prices due to increased ethanol use have ranged from $0.17 per gallon (adjusted for ethanol's lower energy density) in 2008 to $1.09 per gallon in 2012.

The impact of ethanol and the RFS on gas prices first came into focus in the summer of 2008, when Texas Governor Rick Perry requested a waiver of the RFS. In June 2008, the U.S. Departments of Energy and Agriculture conducted an analysis that concluded, "We estimate that, if we had not been blending ethanol into gasoline, gasoline prices would be between 20 cents per gal. to 35 cents per gal. higher." That same month, analysts at Merrill Lynch found, "On a global scale, biofuels are now the single largest contributor to world oil supply growth. We estimate that retail gasoline prices would be $21/bbl higher ($0.50/gal.), on average, without the incremental biofuel supply." In the fall of 2008, McKinsey & Company released a detailed analysis it conducted for the National Renewable Energy Laboratory (Attachment 1). The McKinsey study found, "Ethanol blending in the U.S. [at 2008 levels; ~6% of gasoline supply] is keeping U.S. retail gasoline prices about 17 cents per gallon lower than they would be with no ethanol…As mentioned above, this takes into account the lower mileage impact of ethanol. If available ethanol volumes can be increased economically, ethanol has the potential to lower gasoline prices even further: with economic blending to an average ethanol concentration of 20 percent nationwide, the per-gallon savings (mileage adjusted) could reach 18 to 63 cents."

Du & Hayes of the Center for Agriculture and Rural Development (CARD) published a paper in Energy Policy in August 2009 that concluded, "…the growth in ethanol production has caused retail gasoline prices to be $0.29 to $0.40 per gallon lower than would otherwise have been the case." Du & Hayes updated their analysis in April 2011, finding that "…over the sample period from January 2000 to December 2010, the growth in ethanol production reduced wholesale gasoline prices by $0.25 per gallon on average. Based on the data of 2010 only, the marginal impacts on gasoline prices are found to be substantially higher given the much higher ethanol production and crude oil prices. The average effect increases to $0.89/gallon…"

[12] *Ibid.*

In February 2012, Marzoughi & Kennedy of Louisiana State University presented a paper (Attachment 2) finding that "…every billion gallons of increase in ethanol production decreases gasoline price as much as $0.06 cents. Adding ethanol to gasoline has the same impact on gasoline as a positive shock to gasoline supply." They further concluded that, "Based on estimation results for the impact of ethanol production on gasoline price, [the amount of ethanol produced in 2011] can lower the gasoline price as much as $0.78 cents per gallon. …This low price means around $107 billion in annual savings for U.S. drivers as a whole." Finally, Du & Hayes updated their analysis (Attachment 3) again in May 2012, finding that, "…over the period of January 2000 to December 2011, the growth in ethanol production reduced wholesale gasoline prices by $0.29 per gallon on average across all regions. Based on the data of 2011 only, the marginal impacts on gasoline prices are found to be substantially higher given the increasing ethanol production and higher crude oil prices. The average effect across all regions increases to $1.09/gallon…"

There are at least three important dynamics explaining ethanol's ability to reduce gasoline prices.

- **The effect of fuel supply extension on gasoline prices**. Cumulatively, more than 75 billion gallons of ethanol were added to the gasoline supply from 2005-2012—an average of 9.4 billion gallons annually. Basic economic theory establishes that increasing the supply of substitutable-in-consumption goods will reduce the price for those goods, ceteris paribus. This effect can be understood by considering the analogous example of butter and margarine: prices for butter are forced downward when margarine (a cheaper substitute) is introduced to the marketplace and overall supply of these two substitute goods is enlarged. In the case of ethanol, according to Hayes, "It is as if the US oil refining industry had found a way to extract 10% more gasoline from a barrel of oil." The magnitude of this effect will depend on the amount of the substitute good introduced to the market, the time period over which the good is introduced, the price elasticity of demand, and other factors.

- **The wholesale discount of ethanol to gasoline blendstock**. Ethanol has consistently sold at a discount to gasoline blendstock at the wholesale level since 2007. Since 2010, ethanol prices have averaged approximately 83% the price of RBOB, or $0.47/gallon less (at times, the "spread" has been $1/gallon or wider). This means E10 has been an average of about $0.05/gallon cheaper than unblended gasoline based strictly on straightforward blending economics. The wholesale spread between ethanol and gasoline during this period has served as a strong economic incentive for gasoline blenders and refines to maximize their use of ethanol. Ethanol opponents often suggest ethanol's discount to gasoline is offset by its lower energy content—this argument ignores the larger supply extension effects (discussed in the first bullet point above) and the actual role of ethanol in gasoline blends (discussed in the bullet point below).

- **The price differential between ethanol and other oxygenates and octane sources**. Ethanol is a high-octane fuel that is used ubiquitously by refiners and blenders to increase gasoline octane to the minimum levels required for sale (87 AKI in most states). Using ethanol in lieu of other octane enhancers has allowed refiners to reduce the use of energy-intensive alkylation and reforming units, significantly reducing gasoline production costs. Ethanol has consistently been priced far below other sources of octane over the past several years. In the absence of ethanol,

refiners would be required to use much higher-priced octane sources (many of which, incidentally, are highly toxic in nature), which would necessarily increase gasoline prices at wholesale/retail. A recent analysis by the Department of Energy (Attachment 4) found that even if ethanol prices were 110% the price of CBOB gasoline (compared to 80-85% today), it would still be more economical for refiners to use ethanol for octane enhancement rather than producing octane from other petroleum processes in the refinery.

6. **Could the RFS be modified to enhance energy security further? Should the range of qualifying fuels be expanded? If so, how? If not, why not?**

No, the RFS should not be modified in any way. The current structure is working as intended to enhance domestic energy security and diversify the transportation fuels portfolio. The range of qualifying fuels is already quite broad and should not be expanded. Natural gas derived from biogenic sources (i.e., "biogas") used as transportation fuel already qualifies to generate RIN credits under the existing RFS. Similarly, renewable electricity (e.g., from wind, solar, hydro) qualifies for RIN credit generation if used as a transportation fuel. Indeed, there are only two overarching criteria that transportation fuels must meet in order to qualify for the RFS: 1) that the fuels are derived from "renewable biomass," and 2) that the fuels reduce greenhouse gas emissions by specified levels relative to petroleum. If a fuel meets these two basic criteria, it can qualify for the RFS.

Further, it is important to be mindful of the multiple purposes of the RFS. In addition to enhancing energy security and reducing crude oil consumption, the policy was intended to create a stable market for *renewable* fuels with *superior environmental performance* to petroleum. Opening the RFS to nonrenewable fossil-derived fuels such as natural gas from fracking would substantially undermine Congress' intent to encourage development of more environmentally sustainable transportation fuels. Even the petroleum industry has seemingly acknowledged the inherent problems associated with converting natural gas into ethanol to generate RFS credit. According to a recent analysis released by the Institute for Energy Research, "Producing ethanol from natural gas is expensive, emits significant amounts of additional carbon dioxide, and is wasteful of the energy content as well as the hydrogen content of the natural gas that can be used more efficiently in alternate applications." Finally, the refueling infrastructure for alternative transportation fuels such as compressed natural gas (CNG) or electricity is virtually nonexistent today. Installation of such infrastructure would require far greater investment than would be required to continue the transition to greater biofuels usage.

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Thank you again for the opportunity to comment. If there is any additional information you would like RFA to provide, please do not hesitate to ask.

Sincerely,

Bob Dinneen
President & CEO