

Testimony of:

Mr. Brooke Coleman

Executive Director, Advanced Biofuels Business Council

U.S. House of Representatives

House Energy and Commerce Committee, Subcommittee on Environment

June 22, 2018

One Page Summary of Key Points

The Advanced Biofuels Business Council represents worldwide leaders who are developing and commercializing next generation, advanced and cellulosic biofuels, ranging from cellulosic ethanol made from switchgrass, wood chips and agricultural waste to advanced biofuels made from sustainable energy crops, municipal solid waste and algae.

The Council's website (AdvancedBiofuels.org) details roughly two dozen advanced/cellulosic biofuel projects in the United States and abroad.

My testimony today will focus on how to generate growth in the advanced and cellulosic biofuel sector.

The answer is straightforward: stay the course on the Renewable Fuel Standard (RFS). The RFS makes competition possible in an otherwise non-competitive market, making our industry's future prospects and the trajectory of our success tied to key decision-making by regulators and legislators.

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Good morning Chairman Shimkus, Ranking Member Tonko, and members of the Subcommittee. My name is Brooke Coleman and I am the Executive Director of the Advanced Biofuels Business Council (ABBC).

The Advanced Biofuels Business Council represents worldwide leaders who are developing and commercializing next generation, advanced and cellulosic biofuels, ranging from cellulosic ethanol made from switchgrass, wood chips and agricultural waste to advanced biofuels made from sustainable energy crops, municipal solid waste and algae. Our companies produce a wide variety of advanced biofuels and chemicals, including cellulosic ethanol, biodiesel, biogas and bio-jet fuel. Our members include those operating production facilities, those augmenting conventional biofuel plants with “bolt on” or efficiency technologies and those developing and deploying the technologies that make advanced biofuel production a commercial reality, including some of the largest cellulosic ethanol and advanced

biofuel enzyme production facilities in the world. The Council's website (AdvancedBiofuels.org) details roughly two dozen advanced/cellulosic biofuel projects in the United States and abroad.

My testimony today will focus on how to generate growth in the advanced and cellulosic biofuel sector. The answer is straightforward: stay the course on the Renewable Fuel Standard (RFS). The RFS makes competition possible in an otherwise non-competitive market, making our industry's future prospects and the trajectory of our success tied to key decision-making by regulators and legislators. Ongoing biofuel industry growth – particularly in advanced biofuels – will depend on consistent administration of the RFS as required by the statute, coupled with increased synchronization between the broader policy goal of increased biofuel use and the gasoline/motor fuel regulations that restrict or facilitate those outcomes.

1) The RFS reduces our reliance on foreign oil and insulates American consumers from the price fluctuations in the global oil market, controlled by outside forces like OPEC.

Global oil markets are (collusively) price-controlled by OPEC at the global level and are extremely consolidated and vertically integrated domestically. The absence of free market forces in the liquid fuel marketplace are a problem for the advanced biofuels industry (and other innovators) because non-competitive marketplaces do not properly facilitate and reward innovation.

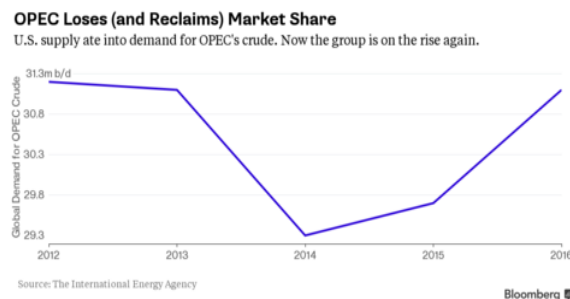
Non-competitive and non-price driven markets are almost impossible to predict regarding future demand opportunity, because the market does not behave based on free market fundamentals and the creation of a better product does not necessarily translate into market demand.

This lack of predictability increases investment risk – or makes risk difficult to assess precisely – which in turn drives investment and potential strategic partners to other sectors.

Recent trends are a case in point for why proper RFS implementation is so important to the development of advanced biofuels.

Certain members of OPEC decided in late 2014 to allow global crude oil prices to slip in part to stop competition from emerging U.S. domestic tight oil production and reclaim market control. In simple terms, colluding to lower the price of oil changes the economics on U.S. oil (and other fuel) production, which struggled to compete with collusively depressed oil prices in the 2014-16 timeframe.

A recent Bloomberg report entitled “OPEC Is About to Crush the U.S. Oil Boom” notes that the strategy worked during that period.¹ And an OPEC September 2015 report openly acknowledged the effort and its effects: “In North America there are signs that US production has started to respond to reduced investment and activity. Indeed, all eyes are on how quickly US production falls.”² As U.S. domestic oil production slowed, dependence on OPEC oil turned directionally and increased again through 2016. The figure below shows how quickly Saudi Arabia recovered market share in the wake of artificially depressed oil prices.



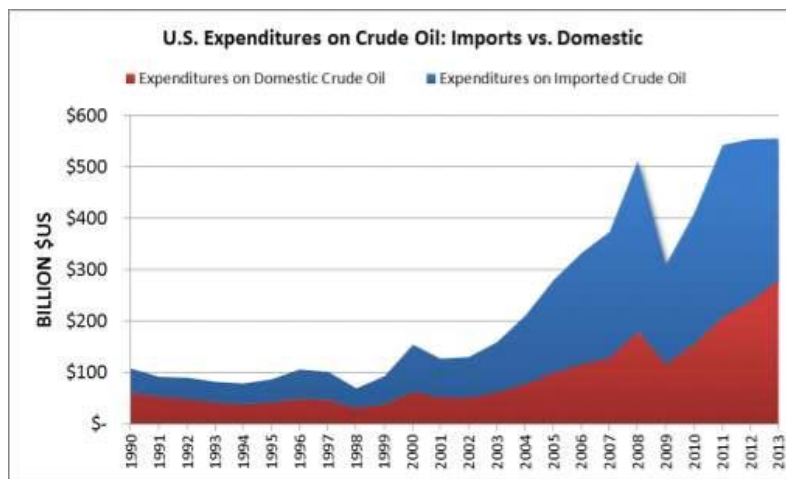
Even with “new” U.S. oil production, the vulnerability of the U.S. economy to foreign oil dependence is all about price. OPEC will inevitably reduce output at some point, and crude oil prices will increase sharply. If the U.S. continues to consume far more oil than it produces (inevitable) and oil prices

¹ See: <http://www.bloomberg.com/news/articles/2015-10-20/after-year-of-pain-opec-close-to-halting-u-s-oil-in-its-tracks>.

² See: http://www.opec.org/opec_web/static_files_project/media/downloads/publications/MOMR_September_2015.pdf.

increase (inevitable), consumers will continue to spend enormous sums of money on foreign oil and the U.S. economy will continue to suffer at the hands of its dependence on foreign oil.

The magnitude of the economic drain can be staggering. Americans transferred nearly \$1 trillion to OPEC members during the oil price spike of 2008, in just 6-8 months. The figure below demonstrates how increasing U.S. oil production does not necessarily protect the U.S. economy and consumers from unsustainable and dangerous levels spending on foreign oil.

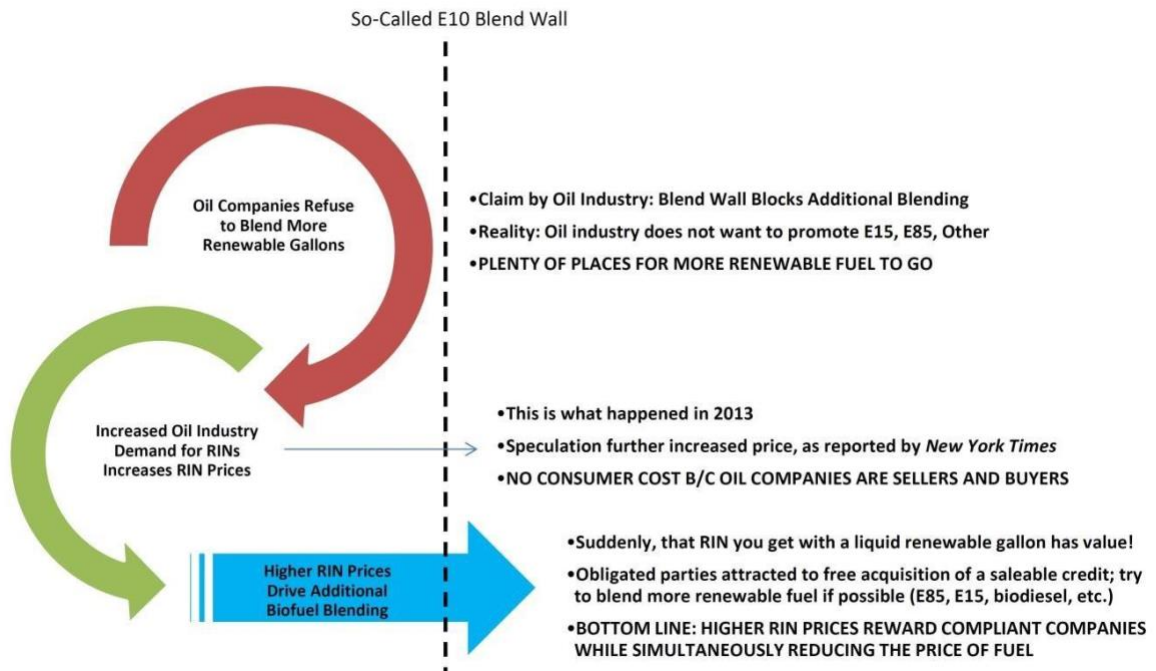


2) The RFS opens markets to renewable fuels, notwithstanding resistance among incumbents to utilizing low carbon renewable fuels.

With the RFS, Congress sought to bolster energy independence and security by increasing the amount of clean, renewable fuel used in the domestic transportation fuel pool. The RFS is an aggressive but flexible program that requires obligated parties to blend increasing volumes of various types of renewable fuel over time. The RFS does what a free market would do on its own: reward innovation.

The effectiveness of the program essentially boils down to how EPA manages market demand for Renewable Identification Numbers (RIN). The primary value of the RIN program, other than facilitating compliance and some level of compliance flexibility, is its ability to increase market access for renewable fuels. That is, when an oil company refuses to blend more liquid biofuel, they can buy a RIN on the open market instead. If a significant number of oil companies refuse to blend liquid gallons and seek RINs on the open market, RIN trading and values increase because of this affirmative non-compliance. Higher RIN prices then provide an extra incentive for other obligated parties to blend physical quantities of (liquid) renewable fuel, because they acquire a (now more) valuable and salable RIN with each gallon of renewable fuel purchased.

How RINs Work to Facilitate Objectives of RFS



Source: ABBC Presentation, Third Way Briefing, U.S. Senate Briefing

Actions to artificially depress the price of RINs – like a RIN cap or an export subsidy – depress biofuel demand and undermine the RFS program.

3) Cellulosic and advanced biofuels have significant growth opportunities under a properly administered RFS.

When the RFS is properly administered, there is enormous growth opportunity for advanced and cellulosic biofuels.

Gasoline demand is increasing, not decreasing. The week ending June 8, 2018 marked the highest weekly gasoline consumption ever recorded in the United States.³ Gasoline consumption reached a new record high in 2016, breaking the previous record from 2007. Consumption is consistently matching that level and expected to reach another record high in 2018 and again in 2019.⁴ Advanced and cellulosic biofuels cut emissions in every gallon and insulate U.S. consumers from the price impacts of the global oil market.

According to the Sandia National Laboratory, the U.S. could produce 75 billion gallons per year of cellulosic biofuels (one subset of the advanced biofuel industry) without displacing food and feed crops.⁵ This would be enough cellulosic biofuel alone to displace more than half of gasoline demand. A Bloomberg analysis looked at select regions in the world to assess the potential for next generation ethanol production. The study found that eight regions – Argentina, Australia, Brazil, China, EU-27, India, Mexico and the United States – could displace up to 50 percent of their demand for gasoline by 2030 making cellulosic ethanol from a very small percentage of its each region’s agricultural residue supply alone.

It is both an exciting and challenging time for the cellulosic biofuels industry and the advanced biofuel industry as a whole. The technology is commercially ready, and the industry is deploying at

³ See <https://www.eia.gov/petroleum/weekly/gasoline.php>, June 20, 2018

⁴ See <https://www.eia.gov/outlooks/steo/marketreview/petproducts.php>; June 20, 2018.

⁵ See https://share.sandia.gov/news/resources/news_releases/biofuels-can-provide-viable-sustainable-solution-to-reducing-petroleum-dependence-say-sandia-researchers/.

commercial scale. We are embarking on the process of securing efficiencies that can only be achieved via commercialization (i.e. the “experience curve”) and economies of scale. When the corn ethanol industry started building plants, their production costs exceeded their feedstock costs by a large margin. However, corn ethanol producers have reduced their production costs by roughly 60 percent since the first commercial plants were built in the 1980s. Likewise, some solar companies have seen a similar 60-70% production cost reduction in just the last ten years, as capacity has increased significantly. The U.S. is in position to lead the world when it comes to the development of advanced, low carbon biofuels. And yet, we face as much policy uncertainty as we ever have before, almost always generated by fabricated claims about renewable fuels and the RFS. Incumbents in the fuel energy space are going after our tax provisions, our farm bill programs, and of course, the RFS. It is important to understand that this is happening because of the effectiveness, rather than ineffectiveness, of these programs to drive consumer choice at the pump.

4) EPA’s failure to act on regulations to permit year-round sales of E15 is impeding market growth for cellulosic ethanol and sidelines a policy action that will increase biofuel blending and reduce RIN prices, lower gas prices and cut emissions.

The Environmental Protection Agency has failed to move forward with regulations to permit year-round sales of E15, creating market uncertainty and preventing growth.

E15 adoption – as essentially a 3-season fuel – has helped cellulosic ethanol makers demonstrate growing ethanol demand, which can be a challenge for investors to internalize in a complex, regulated market. However, the unavailability of E15 in the summer has dampened retailer interest in making the arrangements to offer the fuel at all. And it has thereby dampened enthusiasm on the project finance side due to uncertain market demand.

- E15 is currently available in 30 states, but the current regulations limit the availability of E15 during the summer months when consumers are spending more time on the road. E15 is currently not able to be sold from June 1 to September 15. Fixing the Reid Vapor Pressure (RVP) regulations would put us on the path to an additional 1.3 billion gallons of ethanol demand within five years.
- Fixing the RVP would also reduce costs for retailers. E15 retailers face costs of up to \$1.5 million dollars each year just to relabel pumps around RVP when E15 can and cannot be sold, while other markets are entirely shut off for consumers because retailers cannot adjust for these barriers.
- Allowing E15 to be sold year-round will increase RIN supply and bring down RIN prices – a request refiners repeat frequently.
- Increased use of E15 will lower gas prices for consumers.

Some have argued that the cellulosic ethanol industry does not need a growing overall ethanol marketplace to succeed since second-generation ethanol can theoretically displace first-generation ethanol in a constrained marketplace. This is a well-meaning, but illogical, argument for two primary reasons.

First, the biofuel industry is inherently linked together. As shown in a Third Way report, most cellulosic ethanol first movers are also first-generation ethanol producers.⁶ As such, any policy that requires second-generation ethanol production to displace first-generation ethanol essentially requires cellulosic ethanol first movers to cannibalize their current business model. Ethanol companies are not going to innovate to undercut their own existing technology any more than solar and wind companies would invest hundreds of millions of dollars in better panel and turbine technology if they were only

⁶ See <http://www.thirdway.org/report/cellulosic-ethanol-is-getting-a-big-boost-from-corn-for-now>

allowed to displace existing solar panels and wind turbines. Notably, it is the revenue from first generation technology that is often being used to develop second generation technology advanced biofuel technology. And project investors – many of which have existing stakes in these companies – are not going to undercut current assets either.

Second, the primary objective of U.S. biofuel policy – embodied in part by the Energy Independence and Security Act of 2007 – is to reduce the use of foreign oil (i.e. energy independence and security rather than independence from U.S. production of first generation biofuels). Many of the proponents of the replacement of first-generation ethanol with second-generation ethanol cite climate change concerns as the basis of the position (i.e. because cellulosic ethanol has a better carbon footprint than corn ethanol). However, it is unclear how it is more prudent climatologically to displace corn ethanol (recently assessed by USDA to be 43 percent better than petroleum on a full lifecycle basis) rather than petroleum derived from tar sands (~20 percent more carbon intensive than average petroleum) or other increasingly carbon-intensive methods with cellulosic ethanol.⁷

Independent analysis confirms that most types of first- and second-generation biofuels reduce greenhouse gas emissions, in many cases by very large amounts. This includes analysis conducted by U.S. EPA, the California Air Resources Board (CARB), the U.S. Department of Energy, the U.S. Department of Agriculture and top energy labs such as Argonne and Oak Ridge National Laboratories.

For example, the latest peer-reviewed analysis coming out of the U.S. Argonne National Laboratory shows that all types of ethanol – the type of renewable fuel usually scrutinized for its GHG emissions – have significantly lower lifecycle greenhouse gas emissions than petroleum, even with penalty for indirect land use change. It is worth highlighting that the Argonne National Laboratory developed the GREET model, which remains the gold standard for modeling carbon lifecycle emissions

⁷ See https://www.usda.gov/oce/climate_change/mitigation_technologies/USDAEthanolReport_20170107.pdf; <http://www.businessinsider.com/canadas-oil-sands-produce-20-more-greenhouse-gases-2015-6>; and, <http://www.ibtimes.com/us-shale-oil-boom-when-it-comes-co2-emissions-not-all-crude-oil-created-equal-1843616>.

from fuels (e.g. and is the analytical basis for the California Air Resources Board Low Carbon Fuel Standard as “CA-GREET”). In particular (as S. 517 allows for more ethanol use), all five types of biofuels shown below are ethanol. Many of these biofuels are significantly more carbon reductive than technologies often regarded to be the most innovative (electric drive, hydrogen). Some cellulosic ethanol facilities can deliver fuel to market with more than a 90% greenhouse gas emission reduction.

**Latest Well-to-Wheels Greenhouse Gas Emissions Reduction
Relative to Average Petroleum Gasoline**

WTW GHG emission reductions	Corn	Sugarcane	Corn stover	Switchgrass	Miscanthus
Including LUC emissions	19–48% (34%)	40–62% (51%)	90–103% (96%)	77–97% (88%)	101–115% (108%)
Excluding LUC emissions	29–57% (44%)	66–71% (68%)	89–102% (94%)	79–98% (89%)	88–102% (95%)

Source: Argonne National Laboratory⁸

The carbon benefits of increasing the use of renewable fuels are even greater when you consider real world conditions – i.e. the fact that renewable fuels replace marginal (rather than average) gallons of petroleum. To illustrate, Petrobras chief Jose Sergio Gabrielli has declared that “the era of cheap oil is over.” This means that oil companies are shifting very quickly to an increasing reliance on more expensive and riskier “unconventional” fuels – including tight oil (e.g. the Bakken), deep water (e.g. Gulf of Mexico, Deep Water Horizon) and Canadian tar sands (e.g. Keystone) – to meet the global demand for fuel energy.⁹

⁸ See http://iopscience.iop.org/1748-9326/7/4/045905/pdf/1748-9326_7_4_045905.pdf

⁹ See http://www.eia.gov/forecasts/aeo/MT_liquidfuels.cfm#crude_oil

Unconventional oil is harder to find and can result in serious ecological problems (earthquakes, drinking water contamination, ecosystem destruction in the case of the Gulf). But these fuels are also more carbon intensive than the “average petroleum” often used to compare the carbon value of renewable fuels. There are many recent studies that have looked at the real world “marginal” impact of increasing the use of renewable fuels. One of the more extensive is a 2014 analysis conducted by Life Cycle Associates in California, which concluded that today’s first-generation ethanol – assessed by EPA in 2010 to be 21 percent better than 2005 petroleum with regard to lifecycle GHG emissions – is 32 percent better than 2012 average petroleum and 37-40 percent better than petroleum derived from tar sands and fracking. The report notes that using less renewable fuel will increase the use of these “marginal” or unconventional types of oil:

The majority of unconventional fuel sources emit significantly more GHG emissions than both biofuels and conventional fossil fuel sources ... [t]he biggest future impacts on the U.S. oil slate are expected to come from oil sands and fracking production ... significant quantities of marginal oil would be fed into U.S. refineries, generating corresponding emissions penalties that would be further aggravated in the absence of renewable fuel alternatives.” *Source: Life Cycle Associates, January 2014*

These findings are consistent with recent (lower resolution) assessments by federal agencies. For example, a recent report released by the Congressional Research Service (CRS) found that Canadian oil sands are 14-20 percent more carbon intensive than the 2005 EPA baseline.¹⁰ As such, it is an inescapable reality that any proposal to increase renewable fuel blending is a proposal to reduce U.S.

¹⁰ See <http://www.fas.org/sgp/crs/misc/R42537.pdf>

consumption of high carbon intensity, unconventional oil. If the high-carbon-intensity marginal gallon of oil is displaced by cellulosic ethanol, the carbon benefits are enormous.

5) EPA actions have destroyed demand for biofuels, limiting growth of advanced and cellulosic biofuels.

This year, EPA approved at least 25 small refinery waivers for refiners, some of which are not small or experiencing hardship.¹¹ These actions are a massive expansion of the previous use of the waiver authority. It has been reported that EPA granted small refinery waivers to almost any refiner who applied, including industry giants.

The improperly granted waivers are destroying biofuel demand and have rolled back the amount of renewable fuel blended into our transportation fuel to 2013 levels. The waivers have cut biofuel consumption by 1 to 1.5 billion gallons to 2013 levels, cutting demand for corn by over 2 million acres at a time when farm incomes are at 2006 levels.¹²

EPA has also granted at least two retroactive waivers, further destroying biofuel demand and forgiven 500 million gallons of a single refiner's obligation as part of a bankruptcy proceeding.¹³

And, the EPA has failed to act on a Court remand to add 500 million gallons back into the 2016 RVO.¹⁴

Because of the importance of the RFS in providing market access to a non-competitive market for biofuel producers, administration of the RFS in this manner, which is inconsistent with the law, impedes growth in the biofuel sector.

¹¹ See <https://www.reuters.com/article/us-usa-biofuels-epa-refineries-exclusive/exclusive-epa-gives-giant-refiner-a-hardship-waiver-from-regulation-idUSKCN1HA21P>.

¹² Letter from National Corn Growers Association to EPA Administrator Pruitt, April 4, 2018.
Letter from Growth Energy to EPA Administrator Pruitt, April 4, 2018.

¹³ See <https://www.reuters.com/article/us-usa-biofuels-waivers-exclusive/exclusive-epa-grants-refiners-biofuel-credits-to-remedy-obama-era-waiver-denials-idUSKCN1IW1DW>.

¹⁴ See [https://www.cadc.uscourts.gov/internet/opinions.nsf/5F1D8BC9815C4C698525816B00543925/\\$file/16-1005-1686284.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/5F1D8BC9815C4C698525816B00543925/$file/16-1005-1686284.pdf).

6) EPA delays in approving new pathways for advanced and cellulosic biofuels are slowing growth.

In 2017, EPA staff identified ethanol made from corn fiber as a cellulosic biofuel exceeding expectations and forecasts. And yet, the proposed 2018 RVO included very low targets for corn fiber ethanol and EPA lowered them in the final rule.

Registrations for the individual companies seeking to be eligible for D3 RINs are held up in the regulatory process at EPA. Corn fiber cellulosic ethanol is commercial-ready, stands to create a huge potential growth opportunity in the middle of the country, yet is being held back by red tape. This approach creates a self-fulfilling prophecy in which cellulosic biofuels are held out of the marketplace due to regulatory delay.

7) Refiner regulatory and legislative proposals will reduce demand for advanced and cellulosic biofuels and impede growth.

A) 95 RON Standard

E15 is approved for all 2001 and newer automobiles, representing roughly 90 percent of the vehicles on the road today and has been run for nearly 4 billion consumer miles without any issues. It is sold in 30 states today.

There are clear benefits of moving to a high-octane, midlevel ethanol blend, such as E30, including vehicle engine efficiency, lower tailpipe emissions, and increased use of renewable fuel. But, the refining sector is focused on moving to a 95 RON fuel and repealing the RFS. There are numerous problems with this approach.

- A 95 RON fuel could easily be met with today's premium gasoline, and there would be little to no incentive to move to biofuel blends above 10 percent.

- Most significantly, it cannot be assumed that an increase in octane to 95 RON will be the necessary driver to continue to grow demand for American-made biofuels and for corn *without the access to the market* provided by the RFS.
- A refining industry witness made the point during a hearing before this Subcommittee in response to questions that refiners could choose to move to a non-biofuel, synthetic additive (like MTBE) to meet a 95 RON standard.

B) Export Subsidy RIN

Export subsidy RINs would undermine the goal of the RFS by artificially depressing RIN prices and destroying biofuel demand, reducing demand for corn and hurting farmers. Attaching RINS to exports would lead to retaliatory trade measures by our trading partners, cutting off export markets for U.S. biofuels. U.S. Corn producer revenues losses are estimated to be between \$4.2 billion and \$16.7 billion over the next five years under an export subsidy scheme. Prices are expected to fall between 4 and 40 cents per bushel.¹⁵

Conclusion

The RFS is critical to reinvigorating growth in America's heartland and making America more energy secure. The RFS already supports hundreds of thousands of manufacturing jobs, creates new market opportunities for America's farmers and innovators, and has attracted billions of dollars of investment in first-of-a-kind technologies in the advanced and cellulosic biofuels industry.

As previously explained, the RFS is poised to drive the next manufacturing wave across America. Many of the same companies and regions producing first-generation biofuels are now commercializing

¹⁵ "The Impact of Applying RINs to U.S. Ethanol Exports on Corn Farm Revenues," Agribusiness Consulting, presented at Fuels America Briefing June 7, 2018.

EPA-approved advanced and cellulosic biofuels from agricultural residues. The first-generation ethanol industry and our advanced biofuel industry are inherently linked. And, emerging technologies can convert an even broader assortment of biomass and waste materials into American-made biofuels.

The RFS makes competition possible in an otherwise non-competitive market, making the trajectory of our success tied to key decision-making by regulators and legislators. Ongoing biofuel industry growth – particularly in advanced biofuels – will depend on consistent administration of the RFS as required by the statute, coupled with increased synchronization between the broader policy goal of increased biofuel use and the gasoline/motor fuel regulations that restrict or facilitate those outcomes.

Thank you for the opportunity to speak with you today, and I look forward to your questions.