



An Overview of the Renewable Fuel Standard and Why It Is Good for the Climate

By Mari Hernandez and Matt Kasper | December 11, 2013

Eight years have passed since the Renewable Fuel Standard, or RFS, was first enacted; today, legislators are examining the effects of this landmark law. The ongoing debate often centers on corn ethanol and its effects on corn prices, the amount of renewable fuel that can be blended with conventional gasoline, and the oil savings and environmental benefits. Critics argue that the RFS-mandated path to cleaner-burning biofuels has led to little success in terms of production of advanced biofuels. Cellulosic biofuels, however, are on the verge of commercial-scale production, due to the RFS and the market certainty it has created for investors. The RFS is set to transform the traditionally petroleum-dependent transportation sector through the development and mandated use of low-carbon renewable fuels. These advanced biofuels will help the United States reduce its dependence on carbon-heavy fuels and contribute to its goal of reducing carbon pollution 17 percent below 2005 levels by 2020.

What is the RFS?

The RFS is a federal program signed into law by President George W. Bush under the Energy Policy Act of 2005 and then expanded by the Energy Independence and Security Act of 2007, or EISA.¹ The original intent of the law was to enhance U.S. energy security by replacing some imported petroleum with domestically produced ethanol. Congress also sought to drive investment in the development and production of cellulosic and advanced biofuels that yield significantly less carbon pollution than conventional ethanol, gasoline, and diesel fuels.

The RFS program requires renewable fuel to be blended into motor-vehicle fuels and fuels for nonroad, locomotive, and marine engines in increasing amounts each year.² The RFS created under the 2005 law, referred to as RFS1, set annual renewable-fuel-blending requirements for 2006 through 2012, starting at 4 billion gallons in 2006 and rising to 7.5 billion gallons in 2012. The 2007 RFS, or RFS2, raised the annual blending obligations for

2008 through 2012 set under RFS1 and also extended the annual renewable fuel requirements through 2022. RFS2 requires the use of 36 billion gallons of renewable fuel annually by 2022, while setting an annual cap of 15 billion gallons of corn ethanol starting in 2015. The remaining 21 billion gallons will come from advanced and cellulosic biofuels. Table 1 shows the annual renewable fuel volumes required under RFS2.

TABLE 1
RFS2 annual renewable fuel requirements in the EISA, in billions of gallons

| Year | Corn ethanol | Advanced biofuel | | | Total | Total renewable fuel |
|------|--------------|------------------|----------------------|------------------|-------|----------------------|
| | | Cellulosic | Biomass-based diesel | Undifferentiated | | |
| 2008 | 9 | | | | | 9 |
| 2009 | 10.5 | | 0.5 | 0.1 | 0.6 | 11.1 |
| 2010 | 12 | 0.1 | 0.65 | 0.2 | 0.95 | 12.95 |
| 2011 | 12.6 | 0.25 | 0.8 | 0.3 | 1.35 | 13.95 |
| 2012 | 13.2 | 0.5 | 1 | 0.5 | 2 | 15.2 |
| 2013 | 13.8 | 1 | | 1.75 | 2.75 | 16.55 |
| 2014 | 14.4 | 1.75 | | 2 | 3.75 | 18.15 |
| 2015 | 15 | 3 | | 2.5 | 5.5 | 20.5 |
| 2016 | 15 | 4.25 | | 3 | 7.25 | 22.25 |
| 2017 | 15 | 5.5 | | 3.5 | 9 | 24 |
| 2018 | 15 | 7 | | 4 | 11 | 26 |
| 2019 | 15 | 8.5 | | 4.5 | 13 | 28 |
| 2020 | 15 | 10.5 | | 4.5 | 15 | 30 |
| 2021 | 15 | 13.5 | | 4.5 | 18 | 33 |
| 2022 | 15 | 16 | | 5 | 21 | 36 |

Note: After 2012, EISA instructed biomass-based diesel annual requirements to be determined by EPA through future rulemaking, but no less than 1.0 billion gallons.

Source: United States Environmental Protection Agency

Corn ethanol is a biofuel derived from corn starch. “Advanced biofuels” is a broad term used to describe all second-generation biofuels derived from renewable biomass, including cellulosic ethanol, ethanol derived from sugar or noncorn-based starch, ethanol made from waste material, biodiesel, biogas, and butanol, among others. Cellulosic biofuels are made from nonfood fiber, including cornhusks, switch grass, wood chips, and any other biological material containing cellulose, hemicellulose, or lignin.

To ensure RFS compliance, gasoline and diesel-fuel refiners must annually purchase a set amount of renewable fuels. The refiners are required to submit renewable fuel credits to the Environmental Protection Agency, or EPA, to show that they have covered

their annual obligations. These credits, known as Renewable Identification Numbers, or RINs, are generated by the production of biofuels—one RIN is generated for each gallon of fuel in the RFS program—and can be bought and sold by refiners, as well as banked for future use.

In order to generate RINs, renewable fuels must meet minimum levels of emissions reductions. Corn ethanol must achieve a 20 percent reduction in lifecycle greenhouse gas emissions compared to conventional gasoline, with the exception of grandfathered plants that either existed or began construction before the EISA became law on December 19, 2007, and those plants that use natural gas and/or biofuels as processing fuels and began construction on or before December 31, 2009. Advanced and cellulosic biofuels must achieve lifecycle emissions reductions of 50 percent and 60 percent, respectively, compared to conventional fuels. The emissions calculations must also incorporate indirect land-use changes that may occur due to cultivation of more land to produce the feedstock for the biofuels.

RFS impact

Since 2007, the production of corn ethanol has doubled, keeping pace with the rising annual blending obligations set in the RFS2 and making the United States the number one producer of corn ethanol in the world.³ In 2012, corn ethanol accounted for nearly 7 percent of gasoline consumption on an energy-equivalent basis in the United States.⁴ Advanced and cellulosic biofuels have not ramped up as quickly as expected due to technology scale-up difficulties and the economic downturn in 2008, which made investment capital scarce. Production of cellulosic biofuel began in 2012 and delivered just 20,000 gallons, compared to the RFS2 target of 500 million gallons.⁵ Cellulosic biofuel production is expected to reach 6 million gallons in the 2013 compliance year, which the EPA extended to June 30, 2014.⁶

By 2022, the EPA estimates that renewable fuels will replace 13.6 billion gallons of gasoline and diesel consumption and save motorists nearly \$12 billion each year.⁷ The displacement of conventional gasoline and diesel is also expected to reduce annual greenhouse gas emissions by 138 million metric tons by 2022, which is the equivalent of taking about 27 million vehicles off the road.⁸

Corn prices in the United States are expected to be 8.2 percent higher than business-as-usual projections in 2022 because of the RFS, and they have already been increasing steadily since RFS implementation.⁹ Some of the price increases, however, were due to the drought that reduced corn-crop production in the Midwest in 2012, as well as the price of crude oil.¹⁰ Higher corn prices raise animal feed costs and can have an effect on overall food costs.¹¹ The estimated annual increase in the cost of food due to the RFS is \$10 per person by 2022.¹²

Big Ethanol vs. Big Oil and Big Poultry

In the past few years, debate over the RFS has intensified. What began as a bipartisan effort to decrease oil imports and encourage development of lower-carbon fuels has turned into a highly contentious political battle, pitting powerful interest groups against each other in an effort to sway lawmakers and the public.

The oil industry is calling for Congress to get rid of the law altogether, arguing that it raises food prices, lowers fuel efficiency, and could potentially damage vehicle engines if higher concentrations of corn ethanol are blended into the fuel supply.¹³ The American Petroleum Institute, or API, has also called the RFS a harmful policy that has become unnecessary due to lower gasoline demand and increased domestic oil production.¹⁴ “Ultimately, Congress must protect consumers by repealing this outdated and unworkable program once and for all,” API President and CEO Jack Gerard recently stated.¹⁵

Interestingly, Big Oil is not the only interest group pushing for repeal of the RFS. The poultry industry is also opposed to the RFS, claiming that using corn to make ethanol has increased the price of chicken feed. National Chicken Council President Mike Brown stated, “Since the [Renewable Fuel Standard] was aggressively escalated in 2007, average annual feed costs have skyrocketed by \$8.8 billion for poultry producers.”¹⁶

The ethanol industry, which includes ethanol producers, advocates, and lobbying groups, contends that ethanol production has actually increased the amount of feed produced for livestock and that the price of feedstock is actually more dependent on the cost of oil than the cost of corn.¹⁷ The industry is also quick to highlight the fact that the RFS opens up a traditionally noncompetitive motor-vehicle-fuels market, dismissing many of API’s attacks as scare tactics designed to protect Big Oil’s monopoly.¹⁸ The Renewable Fuels Association calls the RFS a successful energy policy that has reduced oil imports, lowered gas prices, enhanced farm income, and cut greenhouse gas emissions.¹⁹

Environmental concerns

One setback that has invited further criticism is the slow rate at which advanced and cellulosic biofuels have been developed. In the absence of these significantly cleaner advanced biofuels, the only fuel that is currently displacing significant quantities of conventional gasoline is corn ethanol, which has led many experts to question the environmental merits of the RFS.

A recent investigation by the Associated Press, or AP, suggests that the corn-ethanol mandate has taken a heavy environmental toll in the Midwest, as millions of acres of grasslands have been converted to cropland to make ethanol.²⁰ The AP report found that this shift in land use has led to more soil erosion, greater use of fertilizers that run off into rivers and

streams, and the release of carbon dioxide from newly plowed fields—all of which can reduce the environmental advantages that corn ethanol has over conventional gasoline. Because of these concerns, many environmental groups, such as Friends of the Earth and the Clean Air Task Force, are also calling for reform or repeal of the RFS.

According to a peer-reviewed study by Argonne National Laboratory, corn ethanol, on average, lowers greenhouse gas emissions by 34 percent compared to conventional gasoline.²¹ The study took into account corn ethanol's full production lifecycle, including fertilizer production, diesel used for farming, the transport of corn to the ethanol plant, the energy used to produce ethanol at the plant, the transport of ethanol to the market, and land-use changes.

The future of biofuels

The sluggish production of advanced biofuels is set to change within the next few years. In July, INEOS Bio announced that its Indian River County BioEnergy Center in Vero Beach, Florida, began producing cellulosic ethanol at commercial scale.²² And last year, DuPont broke ground on its cellulosic ethanol facility in Nevada, Iowa, which will be among the largest commercial-scale cellulosic biorefineries in the world when it is completed in 2014.²³ The U.S. Energy Information Administration, or EIA, estimated that new cellulosic-biofuel-plant capacity could reach 250 million gallons by 2015.²⁴

Unfortunately, this progress could be undermined by what is known as the blend wall and the policy uncertainty that it could create. The blend wall is the maximum amount of ethanol that can feasibly be blended with each gallon of gasoline. This limit is currently set at 10 percent ethanol—known as E10—because higher blends, such as 15 percent ethanol, or E15, are more corrosive and not approved for use in most existing fuel infrastructures or in cars built before 2001.

When the RFS was created, gasoline consumption was forecasted to continue rising each year, and the EIA predicted in its 2007 Annual Energy Outlook that the blend wall would not be an issue until 2015.²⁵ The decline in gasoline consumption, however, means that refiners will be responsible for using more biofuels than the total supply of gasoline can absorb at concentrations of just 10 percent ethanol. With the blend wall fast approaching, the ethanol industry has pushed for the expansion of fuel pumps that can handle higher blends of ethanol, including 85 percent ethanol, or E85 blends, and for flex-fuel vehicles that can run on gasoline blended with either E10 or E85. There are nearly 10 million flex-fuel vehicles, but only 1,275 of the 160,000 U.S. service stations sell E85 fuel.²⁶ The oil industry has asked the EPA to reduce the biofuels requirements to avoid the blend wall and is pressing Congress to eliminate the program altogether.

Congress gave the EPA the authority to revise the annual RFS requirements under specific conditions, including severe economic or environmental harm and inadequate domestic supply of renewable fuels. In November, the EPA proposed its draft blending volumes for 2014, which reduced the total annual target to 15.21 billion gallons, marking the first time that the EPA has ever adjusted the target to a lower level than the previous year.²⁷ The EPA acknowledged that the blend-wall concerns played into its decision to lower the target.²⁸ Table 2 shows the EPA’s revised annual requirements.

TABLE 2
RFS2 annual renewable fuel requirements revised by the EPA,
in billions of gallons

| Year | Corn ethanol | Advanced biofuel | | | Total renewable fuel |
|-------|--------------|------------------|----------------------|------------------|----------------------|
| | | Cellulosic | Biomass-based diesel | Undifferentiated | |
| 2008 | 9 | 0 | 0 | 0 | 9 |
| 2009 | 10.5 | 0 | 0 | 0.1 | 11.1 |
| 2010 | 12 | 0.0065 | 1.15** | 0.2 | 12.95 |
| 2011 | 12.6 | 0.006 | 1.2 | 0.3 | 13.95 |
| 2012 | 13.2 | 0.01045 | 1.5 | 0.5 | 15.2 |
| 2013 | 13.8 | 0.006 | 1.28 | 0.75 | 16.55 |
| 2014* | 14.4 | 0.017 | 1.28 | 0.75 | 15.21 |

*EPA has issued a proposed rule for the 2014 RFS. The 60 day comment period runs until January 28, 2014.

**EPA combined 2009/2010 biomass-based diesel volumes and applied requirement in 2010.

While the oil industry applauded the EPA’s proposal, ethanol supporters voiced their concerns about how the proposed volumes could affect future investment and growth in the biofuels industry. The ethanol industry also argued that the EPA is reaching beyond its statutory authority by proposing reduced RFS-volume requirements based on the blend wall.²⁹ In response to the EPA proposal, Renewable Fuels Association President and CEO Bob Dinneen said, “By re-writing the statute and re-defining the conditions upon which a waiver from the RFS can be granted, EPA is proposing to place the nation’s renewable energy policy in the hands of the oil companies.”³⁰

Why the United States should stay committed to the RFS

President Barack Obama’s Climate Action Plan calls for the increased use of biofuels as a means of building a 21st-century transportation sector and reducing carbon pollution.³¹ Responsible for nearly 30 percent of greenhouse gas emissions in the United States, the transportation sector is the second-largest contributor of carbon pollution, behind electricity production.³² More than 84 percent of transportation emissions are from fossil-

fuel combustion in on-road vehicles, such as cars, trucks, buses, and motorcycles.³³ Therefore, slashing pollution from these vehicles is essential to meeting the 2020 goal of a 17 percent reduction of greenhouse gas pollution below 2005 levels.

The RFS is a valuable policy that is creating a market for cleaner-burning biofuels that will reduce carbon pollution in the transportation sector and help address the urgent threat of climate change. Although the transition to advanced biofuels has been slower than anyone anticipated, the industry is on the cusp of explosive growth.

The development of advanced biofuels will only continue with the market certainty provided by the RFS, which enables companies to invest in the development and commercialization of cellulosic and advanced biofuels that are half as dirty as conventional fuels. Without the RFS, the diversification of fuel sources, the investment in advanced biofuels, and the effectiveness of U.S. climate policy will be severely limited. Through the RFS and the development of much cleaner biofuels, the United States can continue to reduce petroleum use, enhance energy security, and effectively address climate change.

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