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The Renewable Fuel Standard: In Brief

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Summary

The Renewable Fuel Standard (RFS) requires U.S. transportation fuel to contain a minimum volume of biofuel. The RFS—established by the Energy Policy Act of 2005 (P.L. 109-58; EPAct05) and expanded in 2007 by the Energy Independence and Security Act (P.L. 110-140; EISA)—began with 4.0 billion gallons of renewable fuel in 2006 and ascends to 36.0 billion gallons in 2022. The Environmental Protection Agency administers the RFS. Compliance for the RFS is met using a credit system with renewable identification numbers (RINs). Some have concerns about how EPA is administering the RFS (e.g., the accuracy of EPA projections of the annual amounts of advanced biofuel that will be produced), which biofuels are eligible for which part of the mandate, how the RIN market operates, and the potential impact of the “blend wall,” among other things. Congress has expressed interest in the RFS, particularly the challenges associated with implementing the RFS and with compliance. Some question whether it is time to amend or repeal the RFS or maintain the status quo.



Contents

Introduction..... 1

The Statute 1

Statutory Compliance 1

Considerations 3

 Administering Agency..... 3

 Qualifying Biofuels 4

 RIN Market..... 5

 Blend Wall 6

 External Factors..... 7

Congressional Issues..... 7

CRS Experts..... 8

Contacts

Author Contact Information..... 8

Acknowledgments 8



Introduction

The Renewable Fuel Standard (RFS) is a federal statutory requirement, which mandates that U.S. transportation fuel must contain a minimum volume of biofuel.¹ The mandated minimum volume increases annually, and can be met using both cornstarch ethanol and advanced biofuels. In order for a biofuel to be applied toward the mandate, it must meet certain environmental and biomass feedstock criteria.

The RFS is the only federal energy policy that mandates the use of an alternative energy source for a specific sector with an environmental stipulation: biofuels for transportation that meet certain lifecycle greenhouse gas (GHG) emission reduction thresholds. A variety of factors (e.g., infrastructure, technology, and weather) have led to challenges in meeting the RFS targets. Industry's inability to meet the targets has led to investigations of the RFS by some in Congress, and to court rulings. Because of concerns about the feasibility of the RFS, some stakeholders may question whether it is time to amend or repeal the RFS or maintain the status quo.²

This report provides a basic description of the RFS, including some of the widely discussed issues.

The Statute

The RFS was established by the Energy Policy Act of 2005 (P.L. 109-58; EPL05) and expanded in 2007 by the Energy Independence and Security Act (P.L. 110-140; EISA). The RFS mandate requires that transportation fuel sold or introduced into commerce in the United States annually from 2006 to 2022 contain an increasing volume of a predetermined suite of fuels (4.0 billion gallons of renewable fuel in 2006, ascending to 36.0 billion gallons in 2022). This suite includes renewable fuel, advanced biofuel, cellulosic biofuel, and biomass-based diesel. The annual volumes required are being met mostly with conventional biofuel (e.g., cornstarch ethanol) in the beginning years. In later years, the conventional biofuel volume amounts are held steady, while the mandate increases the requirement of advanced biofuels. For instance, the RFS cellulosic biofuel requirement increases over time from less than 1% of the RFS in 2010 to 44% of the RFS in 2022.³

Statutory Compliance

The EPA regulates compliance with the RFS using a credit system. Obligated parties (generally gasoline and diesel fuel producers and importers) submit credits—called renewable identification numbers (RINs)⁴—to EPA equal to the number of gallons in their annual obligation.⁵ A party's

¹ This report is an abbreviation of CRS Report R40155, *Renewable Fuel Standard (RFS): Overview and Issues*.

² Legislation has been proposed in the 113th Congress that would amend or repeal the RFS (e.g., H.R. 1461, H.R. 1462).

³ Calculations include the annual mandate required by statute in 2007 and do not take into account EPA's revision of the cellulosic biofuel mandate that occurred in 2010, 2011, 2012, and 2013.

⁴ A RIN is a unique 38-character number that is issued (in accordance with EPA guidelines) by the biofuel producer or importer at the point of biofuel production or the port of importation. Each qualifying gallon of renewable fuel has its (continued...)

annual obligation, referred to as the renewable volume obligation (RVO), is the fuel supplier's total gasoline and diesel sales multiplied by the annual percentage standards announced by EPA.⁶ RINs are valid for use in the year they are generated and the following year. Further, obligated parties may carry a limited deficit from one year to the next, but may not carry year-on-year deficits. RINs may be used by the party that generates them or they may be traded with other parties. The EPA Moderated Transaction System (EMTS) is used to register RIN transactions.

Differences Between the 2005 RFS and the 2007 RFS

The RFS was first established in 2005 via the Energy Policy Act. Specifically, Section 1501 (Renewable Content of Gasoline) of EPAAct05 amended Section 211 of the Clean Air Act (CAA) by adding a Renewable Fuel Program. CAA Section 211 requires any gasoline and diesel fuel and fuel additives produced and commercially distributed for use in highway motor vehicles to be registered with EPA. Section 1501 directed the EPA Administrator to ensure that gasoline sold or introduced into commerce in the United States contained a volume of renewable fuel at a certain level annually. This "original" 2005 RFS required 4.0 billion gallons of renewable fuel for 2006, ascending to 7.5 billion gallons by 2012. Subsequent annual volume amounts were to be determined by the Administrator and the Secretaries of Agriculture and Energy. Additionally, the 2005 RFS would have required that 250 million gallons of the renewable fuel be derived from cellulosic biomass starting in 2013.

There are at least five major changes from the 2005 RFS to the 2007 RFS: much larger annual volumes in the 2007 RFS, the establishment of separate requirements for different classes of biofuels (e.g., cellulosic, advanced), the addition of greenhouse gas accounting requirements, a more selective renewable biomass definition, and an expansion of EPA's waiver authority to lower RFS volumes. The renewable biomass definition for the 2007 RFS does not allow for biomass removed from federal lands, and excludes crops from forested lands. Further, the 2007 RFS waiver authority directs the EPA Administrator to set the annual standard for cellulosic biofuels under the RFS for the following year by November 30 of each year, and to lower the cellulosic biofuel standard if projected production is less than the volume in the statute. The 2007 RFS waiver authority also allows the EPA Administrator to reduce the renewable fuel and advanced biofuel requirements of the standard, if the cellulosic biofuel requirement is lowered.

Different biofuels are not treated equally within the RFS, meaning that some biofuels can meet the annual standard for multiple RFS categories. The categories are nested within each other, such that some fuels qualify for multiple categories (e.g., cellulosic ethanol), while others (mainly corn ethanol) may only be used to meet the overall RFS but not the advanced category or its nested subcategories. For example, a gallon of cellulosic biofuel may be used to meet the cellulosic mandate, the advanced biofuel mandate, and the overall RFS. A key part of the definition of each fuel category is whether the fuel achieves certain GHG reductions relative to gasoline and diesel fuel. Each fuel is assigned a lifecycle GHG emission threshold (in proportion to baseline lifecycle GHG emissions for gasoline and diesel).⁷ For example, a fuel must achieve at least a 50% GHG reduction to be considered an "advanced biofuel." Similarly, biofuel must achieve at least a 20% GHG reduction to qualify as a generic renewable fuel.

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own unique RIN.

⁵ For more information, see CRS Report R42824, *Analysis of Renewable Identification Numbers (RINs) in the Renewable Fuel Standard (RFS)*.

⁶ For 2013, the overall biofuel standard was 9.74%, the advanced biofuel standard was 1.62%, the biomass-based diesel standard was 1.13%, and the cellulosic biofuel standard was 0.004%. U.S. Environmental Protection Agency, "Regulation of Fuels and Fuel Additives: 2013 Renewable Fuel Standards; Final Rule," 78 *Federal Register* 158, August 15, 2013.

⁷ For more information, see CRS Report R40460, *Calculation of Lifecycle Greenhouse Gas Emissions for the Renewable Fuel Standard (RFS)*.

In addition to the different categories of RINs, some biofuels generate more RINs per volume than others. This is possible because of the equivalence value (EV) of the biofuel. Biofuels vary in energy content and renewable content, and the EV takes this into account.⁸ For example, because biodiesel has an EV of 1.5 when being used as an advanced biofuel,⁹ 1,000 gallons of biodiesel would equal 1,500 RIN gallons of advanced biofuels. The EV of a renewable fuel represents the number of gallons that can be claimed for compliance purposes for every physical gallon of renewable fuel used.

Considerations

Implementation of the RFS has been complex, and compliance with some of its parts has been challenging. These challenges have raised concerns with many stakeholders. This section briefly explains some of the general issues and associated challenges.

Administering Agency

EPA administers the RFS.¹⁰ This includes evaluating proposed pathways of various biofuel production processes for eligibility in meeting the GHG requirements. In addition, EPA must evaluate the ability of all RFS-eligible renewable fuel facilities to meet the annual standard, release an annual volume supply standard based on these research findings,¹¹ and ensure that annual compliance is met. All of the above must be completed in a one-year time frame, taking into consideration comments from other government agencies, the public, and, recently, court decisions. These responsibilities could be viewed as a significant addition to EPA's regulatory authority, and required EPA to develop new capabilities in order to carry them out. It is not clear that, more than three years after the 2010 issuance of the amended RFS final rule,¹² EPA has mastered those capabilities, in large part because it must rely on critical information from the very biofuel plants that it is evaluating.

One of the concerns some have is the accuracy of EPA's calculations of the annual amounts of advanced biofuel that will be produced in a given year. Using its waiver authority,¹³ the EPA may lower the volume requirements for biofuels if the projected volume is lower than what is in the statute. For instance, EPA used this waiver authority to consistently lower the cellulosic biofuel mandate from 2010 to 2013. EPA's 2012 cellulosic biofuel projection, among other things, was objected to by the American Petroleum Institute and challenged in court. The federal court

⁸ 40 CFR 80.1415.

⁹ All EVs are in relation to the energy content of ethanol. The EV for ethanol is 1.0. One gallon of biodiesel has contains roughly 1.5 times the energy of one gallon of ethanol, and thus has an EV of 1.5.

¹⁰ Although EPA administers the RFS, there are programs under the direction of other federal departments that may indirectly assist biofuel production that may be used to meet the mandate. For example, the U.S. Department of Agriculture provides resources and support for biofuel feedstock development and supply (e.g., Biomass Crop Assistance Program) as well as biofuel infrastructure development (e.g., Rural Energy for American Program, Biorefinery Assistance Program, etc.).

¹¹ On occasion, EPA has approved annual standards for some biofuels different from what was originally scheduled in statute.

¹² Environmental Protection Agency, "Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule," 75 *Federal Register*, March 26, 2010.

¹³ For more information, see CRS Report RS22870, *Waiver Authority Under the Renewable Fuel Standard (RFS)*.

vacated the 2012 cellulosic biofuel standard and provided principles that EPA will have to apply to future annual projections.¹⁴

Another pressing issue for EPA is the timing of the announcement of the annual volume production requirements. For the last three years, EPA has only once announced on time the final rule for the annual RFS standards for the following year.¹⁵ EPA's late announcement of the annual RFS standards may be due to the depth of the analysis (e.g., difficulty in obtaining reliable and timely information from the industry) or to other factors. Even if EPA is exercising the highest level of due diligence and using the most dedicated suite of federal resources, the agency's missing annual standard announcement deadlines and making inaccurate volume projections could have serious consequences for private investors.

Some question whether EPA is the best agency to administer the RFS. The RFS requires intimate knowledge of all levels of the biofuel production chain, something that EPA did not seem to possess prior to the RFS. However, EPA has for the past few years been closely involved with the beginning of the advanced biofuel industry's evolution, allowing EPA an unprecedented view of a technology that could lead to promising results in the future. There may not be an "ideal" agency to administer the RFS. Any agency would likely find it difficult to accurately project when a new technology (i.e., advanced biofuel) selected by Congress, and not yet proven at commercial scale, would come online and at what pace. Other government agencies (e.g., USDA) may be perceived as too close to the industry and thus as lacking objectivity.

Qualifying Biofuels

Various biomass feedstocks (e.g., crop residue, tree residue, algae) can be used to produce multiple types of biofuels. One potentially confusing aspect of the RFS is understanding which biofuel is eligible for which part of the mandate.¹⁶ There are a number of nested categories within the RFS, and a fuel may qualify as an advanced biofuel for one portion or more than one portion of the mandate.¹⁷ Difficulty in understanding all of the advanced biofuels that qualify for the RFS can lead to more difficulty in determining how compliance is being met.

Some misconceptions have arisen regarding eligible biofuels for the RFS. One is that all fuels from a renewable source are eligible. That is not the case. The RFS operates as a biofuel standard, with priority assigned to liquid transportation fuels from biomass feedstocks rather than other renewable sources (e.g., wind). Another misconception is that, by creating the RFS, Congress mandated the production of biofuels. The statutory language does not explicitly mandate the production of biofuels; rather, it mandates the use of biofuel. It could be argued that it is difficult to use a fuel that is not being produced, and that the RFS therefore indirectly does mandate the production of certain biofuels.

¹⁴ American Petroleum Institute v. EPA, 706 F.3d 474 (D.C. Cir. 2013).

¹⁵ Under the CAA, each year's standards are required to be announced by November 30 of the previous year. EPA announced the 2011 final rule in November 2010, the 2012 final rule in December 2011, and the 2013 final rule in August 2013.

¹⁶ For example, there were questions by some about the eligibility of algae-based biofuels for the RFS. For more information, see CRS Report R42122, *Algae's Potential as a Transportation Biofuel*.

¹⁷ Approved RFS fuels and feedstocks are provided by EPA at <http://www.epa.gov/otaq/fuels/renewablefuels/new-pathways/rfs2-pathways-determinations.htm>.

Some of the annual advanced biofuel volumes established by Congress are taking longer than expected to be realized. For example, cellulosic biofuel production volumes are below expectations. This is due to several factors, including lack of financial support, technology setbacks, a down economy, and uneven support from the federal government (among other factors).¹⁸ These factors, coupled with the fact that annual volumes in the statute were established during different economic conditions, may indicate unrealistic volumes for some advanced biofuels for the near future.

RIN Market¹⁹

The RFS created a market for RINs, which may be traded and sold like other commodities. If a party has RINs beyond those they need for compliance in a given year, that party may bank the RINs for the following year, or sell the RINs to other parties.²⁰ Two key questions have been raised about the RIN market and how the system operates: (1) What safeguards are in place to prevent fraud in the system; and (2) what safeguards exist to prevent volatility and excessively high RIN prices?

All RIN transactions are registered with the EPA Moderated Transaction System (EMTS). However, this system is merely a clearinghouse for the transactions; trading parties are responsible for all due diligence. Under this “buyer beware” system, trading parties, of their own accord, must verify the legitimacy of the RINs they are selling or purchasing. The parties are responsible for any fraudulent RINs they pass on to other buyers or submit to EPA for compliance.²¹ In the past, questions have been raised about the validity of the RINs due to fraudulent activity that occurred in the biodiesel RIN market in 2010 and 2011. EPA has since taken steps to establish a voluntary quality assurance program (QAP) for verifying the validity of RINs.²²

While the proposed QAP could help prevent RIN fraud going forward, concerns over high prices and volatility remain. Starting in January 2013, spot prices for conventional ethanol RINs rose dramatically through the first half of the year, spiking to particularly high prices in mid-March and mid-July. Since mid-July, when the possibility was raised by some stakeholders that the 2014 obligations might be lowered, prices have dropped steadily. Some stakeholders have questioned the level of transparency surrounding RIN transactions and the role of non-fuel market players. The March 2013 spike in RIN prices led some lawmakers, as well as stakeholders in the petroleum, livestock, and other industries, to request EPA’s intervention in the RIN market to help lower RIN prices.²³ However, others, including biofuel proponents and many economists, have

¹⁸ For more information, see CRS Report R41106, *Meeting the Renewable Fuel Standard (RFS) Mandate for Cellulosic Biofuels: Questions and Answers*.

¹⁹ For more information on the RIN market, see CRS Report R42824, *Analysis of Renewable Identification Numbers (RINs) in the Renewable Fuel Standard (RFS)*. This section prepared by Brent Yacobucci, CRS Section Research Manager.

²⁰ It should be noted that the RIN market is not limited to obligated parties. Individuals and companies that are not involved with fuel production and/or supply may also own, buy, and sell RINs.

²¹ Obligated parties who purchase fraudulent RINs must pay fines for each RIN submitted, and must submit valid RINs to offset the fraudulent RINs.

²² Environmental Protection Agency, “RFS Renewable Identification Number (RIN) Quality Assurance Program; Proposed Rule,” 78 *Federal Register* 35, February 2013.

²³ See, e.g., Letter from The Honorable David Vitter, Ranking Member, Senate Committee on Environment and Public (continued...)

argued that high RIN prices are a necessary market signal to promote the development of new fuels and infrastructure that would otherwise be uneconomical.²⁴ RINs are currently a largely unregulated market, although various stakeholders are considering ways to increase regulation and oversight of the market.

Blend Wall

The “blend wall”—the upper limit to the total amount of ethanol that can be blended into U.S. gasoline and still maintain automobile performance and comply with the Clean Air Act—is viewed by many to be in direct conflict with the biofuel volumes mandated in the RFS.²⁵ Thus far, the largest volume being met under the RFS is for the non-advanced biofuel segment of the mandate, and this has been met mainly with cornstarch ethanol blended into gasoline. Due to a variety of factors, ethanol content in gasoline is generally limited to 10% (E10). With a relatively fixed supply of gasoline, the amount of ethanol that can be supplied this way is also limited. If the ethanol content of gasoline remains at 10%, and depending on fuel consumption rates, in the near future the RFS may actually require more ethanol than can technically be blended into gasoline.

Some recent developments could alleviate blend wall concerns in the near term. One option would be to blend higher levels of ethanol into conventional gasoline. In 2010 EPA granted a Clean Air Act waiver that allows gasoline to contain up to 15% ethanol for use in model year 2001 and in newer light-duty motor vehicles. However, infrastructure and automobile warranty concerns have precluded widespread offering and purchase of E15, gasoline blended with 10.5% to 15% ethanol. Widespread use of E15 could postpone hitting the blend wall for a few years.

Another option to address the blend wall would be an aggressive push for flexible-fuel vehicles to use E85, a high-level gasoline-ethanol blend containing 51% to 83% ethanol.²⁶ There are infrastructure concerns with the use of E85. There are a limited number of E85 fueling stations, largely clustered in the Midwest, where many flex-fuel vehicles are concentrated. Most of the rest of the flex-fuel vehicles in the United States are on the East Coast and in Texas, which contain far fewer E85 stations.²⁷

If ethanol remains the primary biofuel produced to meet the RFS, at some point the blend wall will have to be addressed or the scheduled levels of biofuels in the RFS cannot be met. In the

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Works, and The Honorable Lisa Murkowski, Ranking Member, Senate Committee on Energy and Natural Resources, to The Honorable Gina McCarthy, Assistant Administrator, Office of Air and Radiation, Environmental Protection Agency, March 20, 2013, <http://www.vitter.senate.gov/newsroom/press/vitter-murkowski-ask-epa-to-protect-americans-from-rising-gas-prices>.

²⁴ For example, see Bruce A. Babcock and Sebastien Pouliot, *The Economic Role of RIN Prices*, Iowa State University Center for Agricultural and Rural Development, CARD Policy Brief 13-PB 14, Ames, IA, November 2013, <http://www.card.iastate.edu/publications/dbs/pdffiles/13pb14.pdf>.

²⁵ For more information, see CRS Report R40445, *Intermediate-Level Blends of Ethanol in Gasoline, and the Ethanol “Blend Wall.”*

²⁶ The U.S. Energy Information Administration reports that as of 2011, there are close to 10 million flexible-fuel vehicles (FFVs) on the road that are designed to use any mix of gasoline and/or E85. However, most of these FFVs are not using E85.

²⁷ Bruce A. Babcock and Sebastien Pouliot, *How Much E85 Can Be Consumed in the United States*, Iowa State University Center for Agricultural and Rural Development, CARD Policy Brief 13-PB 15, Ames, IA, November 2013, <http://www.card.iastate.edu/publications/dbs/pdffiles/13pb15.pdf>.

longer term, the development of non-ethanol biofuels may obviate these concerns, but currently these fuels are not available in sufficient supply to help meet the RFS mandates.

External Factors

The RFS is not a stand-alone policy. It interacts with many external factors that are not easily controlled. For example, advanced biofuel production, at a minimum, requires conversion technology, which itself requires technical expertise and time to ramp up to commercial scale. The massive quantity of biomass feedstocks needed to produce biofuels require factors such as appropriate weather conditions and an expectation of stable markets for feedstock commodities. Further, some types of biofuel production thus far have proven to be dependent on tax incentives in order to be economically feasible (e.g., biodiesel).²⁸ Unexpected occurrences (e.g., drought, failed technology, tax incentive expiration) can impact an entire industry, especially for some advanced biofuels that are nascent industries compared to conventional transportation fuels.

Congressional Issues

The RFS was established at a time when Congress foresaw the need to diversify the country's energy portfolio, strengthen the economy of rural communities by encouraging certain agricultural commodities that contribute to biofuel production, bolster U.S. standing in an emerging segment of the energy technology market, and protect the environment, among other things. Whether the RFS has met, and will meet, those congressional intentions remains to be seen.

The RFS is a policy with an ambitious agenda. If Congress wants to amend or repeal the RFS,²⁹ three of the main considerations may be:

- What should be the purposes of the RFS?
- Is the RFS properly designed to achieve those purposes?
- What happens when, and if, the RFS has achieved its purposes?

At the outset, some would argue that the first question may seem straightforward; the RFS exists to introduce more biofuels into the liquid transportation fuel market. However, upon deeper reflection, it could be argued that the RFS exists to find another market for biomass feedstocks, or to promote the economy of rural America (e.g., the construction of biofuel facilities that create jobs).

The second question is perhaps the most difficult to answer. Many questions have been raised about the challenges in achieving the ambitious RFS targets, given concerns over the blend wall and the slow development of some advanced biofuels. Whether the RFS should be eliminated, amended to address the current challenges in the program, or maintained in its current form is an ongoing question for Congress. A related question is whether the current provisions for EPA to waive various portions of the RFS mandates, as the agency has proposed doing for 2014, are

²⁸ For more information, see CRS Report R41282, *Agriculture-Based Biofuels: Overview and Emerging Issues*.

²⁹ Legislation has been proposed in the 113th Congress that would amend or repeal the RFS (e.g., H.R. 1461, H.R. 1462).

sufficient to address the current supply challenges, or whether the use of these waivers runs counter to the goals of the program.

The third question relates to some current congressional debates regarding the elimination of the conventional (cornstarch) ethanol portion of the mandate. If a segment of the biofuels industry has consistently reached the annual mandate set by Congress, is the mandate still necessary? Some contend that the cornstarch ethanol segment of the biofuels industry is in relatively good financial standing and that a demand exists regardless of congressional involvement. This could lead to the question: Should Congress have created an exit strategy for the RFS?

CRS Experts

For additional information on policy relating to the RFS and biofuels, please consult any of the CRS policy specialists identified below.

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