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The Renewable Fuel Standard (RFS): An Overview

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Summary

The Renewable Fuel Standard (RFS) requires U.S. transportation fuel to contain a minimum volume of renewable fuel each year. 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 requiring 4 billion gallons of renewable fuel in 2006 and was scheduled to ascend to 36 billion gallons in 2022. The Environmental Protection Agency (EPA) has statutory authority to determine the annual volume requirements after 2022.

The total renewable fuel statutory annual target consists of both conventional biofuel and advanced biofuel. Since 2014, the total renewable fuel statutory target has not been met with the advanced biofuel portion falling below the statutory target since 2015. In short, EPA set the total renewable fuel volume below the statutory amount—using its waiver authority—mainly due to underproduction of advanced biofuels. Should the proposed 2020, 2021, and 2022 renewable fuel volume requirements be finalized, the United States will not have met the total renewable fuel target as outlined in statute for the RFS for 2014 through 2022—the last nine years (i.e., the latter half) of the program's statutory annual requirements.

EPA administers the RFS and is responsible for several related tasks. For instance, using the statutory criteria EPA evaluates which renewable fuels are eligible for the RFS program. Also, EPA establishes the amount of renewable fuel that refiners and importers must account for in the coming year based on the statutory targets, fuel supply, and other conditions, and the EPA Administrator can exercise waiver authorities to reduce volumes if necessary. Further, the statute requires that the EPA Administrator "reset" the RFS—modifying volumes required for future years—if certain conditions are met. EPA also monitors compliance for the RFS using a system of tradable credits referred to as renewable identification numbers (RINs).

Congress has expressed ongoing interest in various facets of the RFS, including small refinery exemptions; RFS compliance; EPA approval of fuel pathways (e.g., renewable electricity); EPA's proposal to reduce the 2020 through 2022 requirements; how EPA could use its "reset" authority to determine post-2022 requirements; and how the program performs overall (e.g., environmental effects), among other things. For years, some in Congress have debated various aspects of the RFS, including program management, transparency, and certainty. Further, there have been repeated efforts by some Members to either amend or repeal the RFS, while other Members have acted to maintain the status quo.

In December 2021, EPA published a proposed rule for the RFS volume requirements for 2020, 2021, and 2022 that contains a number of actions. For example, EPA proposes to reduce the previously finalized volume requirements for 2020 (for all fuel categories except biomass-based diesel) and to set 2021 and 2022 volume requirements below the statutory targets. EPA reports that "significant and unanticipated events" (e.g., the COVID-19 pandemic) led, in part, to the proposed 2020 volume reduction. This would mark the first time that EPA has proposed to reduce a volume requirement that was previously finalized. The proposed rule adds a supplemental volume of 500 million gallons of total renewable fuel—split between 2022 and 2023—to address a court remand of the 2016 final volume requirement. Other actions in the proposed rule include the treatment of biointermediates, the treatment of confidential business information (CBI), and defining "produced from renewable biomass" in the Code of Federal Regulations for the RFS. Legislation has been introduced that would prohibit the EPA Administrator from reducing a volume requirement that was finalized (S. 3380). Conversely, some Members of Congress have requested that the EPA Administrator waive or significantly reduce the 2020 volume requirement, and set the 2021 and 2022 volume requirements at "levels that comport with reality."

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Introduction

Established by Congress as an amendment to the Clean Air Act, the Renewable Fuel Standard (RFS) mandates that U.S. transportation fuels contain a minimum volume of renewable fuel.[1] The mandated minimum volume increases annually and generally has been met using both conventional biofuel (e.g., corn starch ethanol) and advanced biofuel (e.g., cellulosic ethanol). For a renewable fuel to be applied toward the mandate, it must be used for certain purposes (i.e., road transportation fuel, jet fuel, or heating oil) and meet certain environmental and biomass feedstock criteria.

The statute outlines annual volume requirements—listed in tables—for four fuel categories: total renewable fuel, total advanced biofuel, cellulosic biofuel, and biomass-based diesel. The total renewable fuel statutory volume required for any given year equates to the sum of conventional biofuel (which is unspecified in statute) and advanced biofuel (which is specified in statute).[2] Both cellulosic biofuel and biomass-based diesel are subcategories of advanced biofuel (both of which are specified in statute). There is also a third advanced biofuel category—other advanced biofuels (which is unspecified in statute).[3]

The statutory volume requirements for both total renewable fuel and total advanced biofuel for the RFS have not been met since 2013. The Environmental Protection Agency (EPA) Administrator has the authority to waive the statutory RFS requirements, in whole or in part, if certain conditions outlined in statute occur.[4] EPA has used this waiver authority multiple times to reduce the volumes obligated parties must blend into transportation fuel. For instance, the 2020 targets set by EPA for total renewable fuel and for total advanced biofuel were approximately 67% and 34% of the statutory targets, respectively.[5] A variety of factors, such as infrastructure limitations, technological development, and limited federal assistance, have contributed to challenges in meeting the total volume requirement established by Congress. These challenges have included a lack of cellulosic biofuel production and delays by the EPA in approving fuel pathways.[6] Oil prices, consumer demand for transportation fuel, and circumstances related to the COVID-19 pandemic from the last few years may also contribute to the challenges in meeting the more recent total statutory volume requirements.

However, two fuel categories consistently have met their statutory targets: conventional biofuel (which has an implied target) and biomass-based diesel (which has an explicit target).[7] Also, since 2014, two advanced biofuel pathways—renewable compressed natural gas and renewable liquefied natural gas—have constituted the majority of the cellulosic biofuel volume requirements as finalized by EPA.[8]

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[1] 42 U.S.C. §7545(o).

[2] Conventional biofuel equates to the difference between the total renewable fuel category and the advanced biofuel category.

[3] Other advanced biofuel is computed by subtracting both the cellulosic biofuel category and the biomass-based diesel category from the total advanced biofuel category.

[4] For more information, see CRS Report R44045, *The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes*, by Kelsi Bracmort.

[5] U.S. Environmental Protection Agency, "Renewable Fuel Standard Program: Standards for 2020 and Biomass-Based Diesel Volume for 2021 and Other Changes," 85 *Federal Register* 7016, February 6, 2020.

[6] For an explanation and discussion of fuel pathways, see the "Administering Agency" section of this report.

[7] U.S. Environmental Protection Agency, *Public Data for the Renewable Fuel Standard Data*, January 5, 2022.

[8] Ibid. EPA defines renewable compressed natural gas as biogas or biogas-derived pipeline quality gas that is

A multitude of factors affect the conditions under which the RFS operates—some external to RFS policy and some internal. The impact of these factors can be challenging to quantify. For example, it is not clear how implementation of the RFS will have adapted to changes in gasoline consumption in response to fluctuating crude oil and gasoline prices, rising feedstock prices, and a global event like the COVID-19 pandemic.[9] It is not clear how agricultural trade issues impact biofuel policies or the commodities used to produce biofuel.[10] It is also uncertain how the program will fare given EPA's intent to implement the "reset" provision of the statute, which allows the agency to modify the volumes required for future years if certain conditions are met.[11]

Challenges to implementing the RFS have led to scrutiny of the program in Congress and to litigation about EPA's regulations.[12] Largely due to concerns about the implementation and feasibility of the RFS, some Members of Congress have expressed their perspectives on EPA's rulemakings as well as EPA's implementation of the program.[13] They also have questioned whether to amend or repeal the RFS or whether to maintain the status quo.[14] This report provides an overview of the RFS, including some of the widely discussed policy issues related to it.[15]

The Statute

The RFS was established by the Energy Policy Act of 2005 (P.L. 109-58; EPAct05).[16] It was expanded in 2007 by the Energy Independence and Security Act (P.L. 110-140; EISA) (see the

compressed for use as transportation fuel and meets the definition of renewable fuel. EPA defines renewable liquefied natural gas as biogas or biogas-derived pipeline quality gas that goes through the process of liquefaction in which it is cooled below its boiling point, and which meets the definition of renewable fuel. See 40 C.F.R. §80.1401.

[9] For more information, see Energy Information Administration, *Crude Oil Demand Returns Faster Than Supply, Increasing Prices and Reducing Inventories*, November 9, 2021; Energy Information Administration, *Agricultural Feedstock Costs Drive RIN Prices to All-Time Highs*, June 2, 2021; and Energy Information Administration, *COVID-19 Mitigation Efforts Result in the Lowest U.S. Petroleum Consumption in Decades*, December 30, 2020.

[10] For more information on agricultural trade issues, see CRS Report R46653, *Major Agricultural Trade Issues in the 117th Congress*, coordinated by Anita Regmi.

[11] The statute granted EPA the authority to "reset" the RFS given certain conditions starting in 2016. EPA proposes to "reduce the applicable statutory volumes for 2020, 2021 and 2022 utilizing both the cellulosic waiver and reset authorities." U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72445, December 21, 2021.

[12] Since 2010, there have been numerous congressional hearings about the RFS. Additionally, there have been multiple legal challenges regarding EPA's administration of the RFS. In some cases, courts have found against EPA's rules for various reasons; in others, courts have affirmed EPA's authority.

[13] See, for example, Sen. Joni Ernst, "Ernst Slams Biden's Move to Slash Demand for Biofuel, Break Campaign Promises," press release, December 7, 2021; and Sen. Shelley Moore Capito, "Capito: EPA Intends to Inflict More Harm on Small Refiners," press release, December 7, 2021.

[14] Legislation has been introduced in the 117th Congress that would repeal, amend, or further support the RFS (see, for example, H.R. 5701, S. 2385, H.R. 5376). For a brief discussion about potential legislative reform for the RFS, see CRS In Focus IF10842, *The Renewable Fuel Standard: Is Legislative Reform Needed?*, by Kelsi Bracmort.

[15] For additional discussion, see CRS Report R40155, *Renewable Fuel Standard (RFS): Overview and Issues*, by Kelsi Bracmort.

[16] More specifically, Section 1501 (Renewable Content of Gasoline) of EPAct05 amended Section 211 of the Clean Air Act (CAA) by adding a Renewable Fuel Program. Section 1501 directed the EPA Administrator to ensure that gasoline sold or introduced into commerce in the United States contained a minimum volume of renewable fuel. This "original" 2005 RFS required 4.0 billion gallons of renewable fuel for 2006, ascending to 7.5 billion gallons by 2012. The amount of renewable fuel was prescribed in EPAct05 for the years 2006 through 2012. Beginning in 2013, the annual volume of renewable fuel was to be determined by the EPA Administrator and the Secretaries of Agriculture and Energy. Additionally, the RFS established in EPAct05 would have required that at least 250 million gallons of the renewable fuel be derived from cellulosic biomass starting in 2013.

text box in this section for a discussion of the differences between the 2005 RFS and the 2007 RFS). The RFS mandate requires that transportation fuels sold or introduced into commerce in the United States contain an increasing volume of a predetermined suite of renewable fuels. The statute required 4.0 billion gallons of renewable fuel in 2006, ascending to 36.0 billion gallons required in 2022, with EPA determining the volume amounts after 2022 in future rulemakings.

The statute centers on four renewable fuel categories—total renewable fuel, advanced biofuel, cellulosic biofuel, and biomass-based diesel—each with its own target volume.[17] A key part of the statutory definition of each fuel category is whether the fuel achieves certain greenhouse gas (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).[18]

The total renewable fuel requirement under the RFS is met with the combination of fuels from two renewable fuel categories: conventional biofuel and advanced biofuel. The requirement for advanced biofuel, in general, can be met with the combination of three types of advanced biofuel: cellulosic biofuel, biomass-based diesel, and other advanced biofuels. To date, the total annual volumes required have been met mostly with conventional biofuel (e.g., corn starch ethanol). Beginning in 2015, the mandate implicitly capped the conventional biofuel volume amounts while increasing the requirement for advanced biofuels.[19] For instance, the statutory RFS total advanced biofuel requirement increases over time from approximately 7% of the total renewable fuel requirement in 2010 to 58% of the total renewable fuel target in 2022.[20]

Differences Between the 2005 ("RFS 1") and the 2007 ("RFS 2") Laws

There are at least five major changes in the RFS as expanded in 2007 by EISA:

- larger annual volume targets specified in statute for an extended period of time (i.e., through 2022),
- the establishment of separate requirements for different classes of biofuels (e.g., cellulosic, advanced),
- the addition of greenhouse gas accounting requirements,
- a different renewable biomass definition (as explained below), and
- an expansion of EPA's waiver authority to lower RFS volumes.

The renewable biomass definition for the RFS under EISA does not make the majority of woody biomass on federal lands available for use as a renewable feedstock. 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 U.S. production is less than the volume in

[17] The statute defines the four renewable fuels. *Conventional biofuel* is corn starch ethanol. *Advanced biofuel* is renewable fuel, other than corn starch ethanol, with lifecycle greenhouse gas emissions of at least 50% less than lifecycle greenhouse gas emissions from its gasoline or diesel counterpart. *Cellulosic biofuel* is renewable fuel derived from cellulose, hemicellulose, or lignin that is derived from renewable biomass, with lifecycle greenhouse gas emissions of at least 60% less than lifecycle greenhouse gas emissions from its gasoline or diesel counterpart. *Biomass-based diesel* is biodiesel or other renewable diesel with lifecycle greenhouse gas emissions of at least 50% less than lifecycle greenhouse gas emissions from its diesel counterpart. Additionally, biofuel from new facilities—those built after enactment of the 2007 law—must achieve at least a 20% GHG reduction to qualify as a conventional renewable fuel. New facilities are facilities that commence construction after December 19, 2007. 42 U.S.C. §7545 (o)(2)(A)(i).

[18] For more discussion, see CRS Report R40460, *Calculation of Lifecycle Greenhouse Gas Emissions for the Renewable Fuel Standard (RFS)*, by Brent D. Yacobucci and Kelsi Bracmort.

[19] Starting in 2015, the statute caps conventional biofuel at 15 billion gallons. From 2015 onward, the increase in the total renewable fuel statutory target stems from the increase in the advanced biofuel statutory target.

[20] Calculations include the annual mandate required by statute in 2007 and do not take into account EPA's revision of the biofuel mandates for 2010 through 2018.

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.

Statutory Compliance

EPA regulates compliance with the RFS using a tradable credit system.[21] Obligated parties (generally, refiners and importers) submit credits—called renewable identification numbers (RINs)—to EPA for each gallon in their annual obligation.[22] (Thus, generally, each gallon of fuel produced to meet the obligation generates its own unique RIN.[23]) In short, the annual obligation for an individual refiner or importer, referred to as the renewable volume obligation (RVO), is the obligated party's total gasoline and diesel sales multiplied by the annual renewable fuel percentage standards announced by EPA.[24] The RVO is used by an obligated party to determine how many RINs they are to submit to EPA at the end of a given year to be in compliance with the mandate.

In short, the RIN lifecycle can be described in three steps:

1. a RIN is attached to a gallon of qualifying renewable fuel once that fuel is produced,
2. the RIN is separated once the renewable fuel is blended with gasoline or diesel fuel or used unblended, and
3. the separated RIN may be submitted for compliance, traded, or banked for future use.

RINs are valid for use to demonstrate compliance in the year they are generated and the following year.[25] 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.

An obligated party incurs a deficit if they are unable to submit enough RINs to meet their RVO for that compliance period. An obligated party may carry a deficit due to a variety of reasons. Obligated parties may carry a deficit from one year to the next, but in the year following the deficit, the obligated party must meet compliance for that year's renewable fuel volume

[21] 42 U.S.C. §7547(o)(5).

[22] EPA defines an obligated party as any refiner that produces gasoline or diesel fuel within the 48 contiguous states or Hawaii, or any importer of gasoline or diesel fuel into the 48 contiguous states or Hawaii during a compliance period. A renewable identification number (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. There are five different RIN types which are assigned based on a fuel's "D-code" depending upon the specific type of fuel. For more information, see CRS Testimony TE10026, *Background on Renewable Identification Numbers under the Renewable Fuel Standard*, by Brent D. Yacobucci.

[23] As will be discussed later in this section, some renewable fuels can generate more RINs per gallon of fuel.

[24] The statute requires the EPA Administrator to express the annual renewable fuel obligation in percentages. 42 U.S.C. 7545(o)(3). For the 2020, 2021, and 2022 proposed rule, EPA proposes a percentage standard range as EPA reports it needs "to consider the impact of these [court] decisions on our SRE [small refinery exemptions] policy, and it is still unclear at this time whether we will be granting SREs for 2020, 2021, or 2022, and if so, to what degree." For 2022, EPA reports the overall renewable fuel percentage standard range is 11.76%-12.33%, the advanced biofuel percentage standard range is 3.27 - 3.42%, the biomass-based diesel percentage standard range is 2.42%-2.54%, and the cellulosic biofuel percentage standard range is 0.44%-0.46%. U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72439, December 21, 2021.

[25] 40 C.F.R. §80.1427(6)(i) in the EPA RFS regulations.

requirement and purchase or generate enough credits to satisfy the deficit from the previous year.[26]

Different biofuels are not treated equally within the RFS. The categories are nested within each other, such that some fuels qualify for multiple categories (e.g., cellulosic ethanol), while others (mainly corn starch ethanol) may only be used to meet the overall RFS but not the advanced category or its nested subcategories.[27] For example, a gallon of cellulosic biofuel may be used to meet the cellulosic biofuel mandate, the advanced biofuel mandate, or the total renewable fuel mandate, possibly making it a more highly valued fuel.[28]

In addition, some biofuels generate more RINs per volume than others because of the difference in the fuel's energy content. This difference is accounted for by a metric referred to as the equivalence value (EV) of the biofuel.[29] 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, and it is generally the ratio of the energy content of a gallon of the fuel to a gallon of ethanol. For example, because biodiesel has an EV of 1.5 when being used as an advanced biofuel, 1,000 physical gallons of biodiesel would equal 1,500 RIN gallons of advanced biofuels.[30]

The 2020, 2021, and 2022 Proposed Rule

EPA released the proposed rule for the 2020, 2021, and 2022 RFS volume requirements on December 7, 2021, and published the proposed rule in the *Federal Register* on December 21, 2021.[31] EPA proposes to reduce the volume requirements from what is required by statute for 2020, 2021, and 2022 (see **Table 1**). More specifically, EPA proposes to *retroactively* reduce the previously finalized 2020 volume requirements for all fuel categories except biomass-based diesel (a final rule was released for 2020),[32] and to reduce the volume requirements for 2021 and 2022 to levels less than what is called for in the statute (a final rule was not released for 2021 and 2022). EPA reports it is "proposing to reduce the applicable statutory volumes for 2020, 2021 and 2022 utilizing both the cellulosic waiver and reset authorities."[33] EPA reports it is using different waiver authorities for different years and different fuel categories.[34] EPA reports that, for 2020

[26] 42 U.S.C. §7547(o)(5)(D).

[27] Although a gallon of a biofuel may be used to fulfill individual sub-requirements or the overall requirement, each gallon counts once against the overall renewable fuel use obligation.

[28] The value of any biofuel within the RFS depends on the RIN price at a given time. As different categories of RINs are used to meet the various standards, there is often a price difference between RINs (e.g., advanced biofuel RINs are generally more expensive than conventional biofuel RINs). However, there is no public market for RINs, so real-time price data are difficult to obtain. EPA does provide historical weekly RIN price data. Environmental Protection Agency, *RIN Trades and Price Information*, January 5, 2022.

[29] 40 C.F.R. §80.1415.

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

[31] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72436, December 21, 2021.

[32] U.S. Environmental Protection Agency, "Renewable Fuel Standard Program: Standards for 2020 and Biomass-Based Diesel Volume for 2021 and Other Changes," 85 *Federal Register* 7016, February 6, 2020.

[33] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72445, December 21, 2021. For more information on waiver authority for the RFS, see CRS Report R44045, *The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes*, by Kelsi Bracmort.

[34] Ibid. For example, EPA reports it is using solely the reset authority to set the total renewable fuel volume

and 2021, it is proposing to set the volumes equal to the actual volumes of advanced biofuel and total renewable fuel consumed during those years.[35] EPA reports that, for 2022, it is proposing to set volumes of advanced biofuel and total renewable fuel that "represent growth compared to historical volumes and compared to the volumes proposed for 2020 and 2021."[36] EPA reports the retroactive reduction of the 2020 volume requirements is necessary because "several significant and unanticipated events" occurred following the release of the 2020 final rule.[37] These events include the COVID-19 pandemic—which led to a drop in transportation fuel demand—and lower than expected gasoline and diesel volume exemptions from the 2020 RFS obligations stemming from small refinery exemptions (SREs).[38] Some Members of Congress have expressed interest in the volumes for 2020 through 2022.[39]

EPA addresses other implementation duties in the proposed rule. For instance, EPA proposes to address the court remand of the 2014-2016 final rule by adding a supplemental volume obligation of 500 million gallons—250 million gallons each for 2022 and 2023.[40] EPA reports that by "applying the supplemental standard to 2022 instead of 2016, RINs generated in 2021 and 2022 could be used to comply with the 2022 supplemental standard" and that obligated parties "subject to the 2022 standards would also be subject to the supplemental standard."[41] Additionally, EPA resumes an effort it first proposed in 2016: to allow the use of biointermediates to produce qualifying renewable fuels under the RFS program.[42] EPA reports it is re-proposing "many aspects of the biointermediate provisions in the proposed [Renewables Enhancement and Growth Support (REGS)] rule but also updates several key aspects of that proposal reflecting what [the agency has] learned since the original proposal."[43] In short, biointermediates are feedstocks made

requirement for 2021. EPA reports it is proposing to use both the cellulosic waiver authority and the rest authority to set the total renewable fuel volume requirement for 2022.

[35] For the 2021 volumes, EPA used actual consumption for months when such data were available and projected consumption for the remaining months in the year. U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72438-72439, 72445, 72448, and 72450, December 21, 2021.

[36] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72450, December 21, 2021.

[37] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72438, December 21, 2021.

[38] For more information on small refinery exemptions, see CRS Report R46244, *The Renewable Fuel Standard (RFS): Frequently Asked Questions About Small Refinery Exemptions (SREs)*, by Kelsi Bracmort. This report does not discuss EPA's proposal to deny over 60 petitions for small refinery exemptions. For more information, see U.S. Environmental Protection Agency, *Proposal to Deny Petitions for Small Refinery Exemptions Proposal to Deny Petitions for Small Refinery Exemptions*, EPA-420-D-21-001, December 7, 2021.

[39] For example, legislation has been introduced that would prohibit the EPA Administrator from reducing the renewable volume obligations once an annual rule is finalized (S. 3380). Sen. Amy Klobuchar, "Klobuchar, Grassley Introduce Bipartisan Legislation to Provide Certainty to Biofuel Producers," press release, December 14, 2021. In contrast, some Members of Congress have requested that the EPA Administrator waive or significantly reduce the 2020 volume requirement, and set the 2021 and 2022 volume requirements at "levels that comport with reality." Letter from Sen. Pat Toomey, Sen. Shelley Moore Capito, and Sen. Cynthia M. Lummis, et al. to Michael Regan, EPA Administrator, August 23, 2021.

[40] In short, the court decision requires EPA to address 500 million gallons of total renewable fuel that EPA reduced from the 2016 mandate by improperly using the RFS general waiver authority. U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72457, December 21, 2021.

[41] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72459, December 21, 2021.

[42] U.S. Environmental Protection Agency, "Renewables Enhancement and Growth Support Rule," 81 *Federal Register* 80833, November 16, 2016.

[43] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal*

from renewable biomass that are generally constructed into a more useable and easily transportable form at one facility and converted to fuel at a different facility. EPA reports that technologies that employ biointermediates could "provide an opportunity for the future growth in production of the cellulosic biofuels required under the RFS program."[44] Lastly, EPA is proposing regulatory changes to include the treatment of confidential business information under the program[45] and defining "produced from renewable biomass,"[46] among other actions.

Register 72465, December 21, 2021.

[44] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72440, December 21, 2021.

[45] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72477, December 21, 2021.

[46] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72479, December 21, 2021.

Table 1. Renewable Fuel Standard Statute, EPA Final and Proposed Volumes

(billions of gallons)

Year	Statute, Final, or Proposed	Total Renewable Fuel	Portion from Advanced Biofuels: Total Advanced Biofuels	Portion from Advanced Biofuels: *Cellulosic Biofuel*	Portion from Advanced Biofuels: *Biomass-Based Diesel*	Cap on Conventional Biofuel	Due Date and Actual Date of Final Rule
2010	**S**	12.95	0.95	*0.1000*	*0.65*	12.00	Nov. 2009
	F	12.95	0.95	*0.0065*	*1.15*	12.00	Feb. 2010
2011	**S**	13.95	1.35	*0.2500*	*0.80*	12.60	Nov. 2010
	F	13.95	1.35	*0.0060*[a]	*0.80*	12.60	Nov. 2010
2012	**S**	15.20	2.00	*0.5000*	*1.00*	13.20	Nov. 2011
	F	15.20	2.00	*0.0105*[b]	*1.00*	13.20	Dec. 2011
2013	**S**	16.55	2.75	*1.0000*	*≥1.00*	13.80	Nov. 2012
	F	16.55	2.75	*0.0008*	*1.28*	13.80	Aug. 2013
2014	**S**	18.15	3.75	*1.7500*	*≥1.00*	14.40	Nov. 2013
	F	16.28	2.67	*0.0330*	*1.63*	13.61	Nov. 2015
2015	**S**	20.50	5.50	*3.0000*	*≥1.00*	15.00	Nov. 2014
	F	16.93[c]	2.88	*0.1230*	*1.73*	14.05	Nov. 2015
2016	**S**	22.25	7.25	*4.2500*	*≥1.00*	15.00	Nov. 2015
	F	18.11[c]	3.61	*0.2300*	*1.90*	14.50	Nov. 2015
2017	**S**	24.00	9.00	*5.5000*	*≥1.00*	15.00	Nov. 2016
	F	19.28	4.28	*0.3110*	*2.00*	15.00	Nov. 2016
2018	**S**	26.00	11.00	7.0000	*≥1.00*	15.00	Nov. 2017
	F	19.29	4.29	0.2880	*2.10*	15.00	Nov. 2017
2019	**S**	28.00	13.00	8.5000	*≥1.00*	15.00	Nov. 2018
	F	19.92	4.92	0.4180	2.10	15.00	Nov 2018
2020	**S**	30.00	15.00	10.5000	*≥1.0*	15.00	Nov. 2019
	F / P[f]	20.09 / 17.13	5.09 / 4.63	0.59 / 0.51	2.43	15.00 / 12.50	Dec. 2019 / Dec. 2021
2021	**S**	33.00	18.00	13.5000	*≥1.00*	15.00	Nov. 2020
	P	18.52	5.20	0.62	2.43[d]	13.32	Dec. 2021
2022	**S**	36.00	21.00	16.0000	*≥1.00*	15.00	Nov. 2021
	P	20.77 (+ 0.25)[g]	5.77	0.77	2.76	15.00	Dec. 2021
2023 and beyond	**S**	To Be Determined by the EPA Administrator[e]					

Source: Energy Independence and Security Act of 2007 (EISA; P.L. 110-140); Final and proposed rules are available at U.S. Environmental Protection Agency, *Regulations and Volume Standards for Renewable Fuel Standards*, January 12, 2022, https://www.epa.gov/renewable-fuel-standard-program/regulations-and-volume-standards-renewable-fuel-standards.

Notes: S = Statute, F = Final, P = Proposed, TBD = To Be Determined. All volumes are ethanol equivalent, except for biomass-based diesel, which is actual. The 2010 biomass-based diesel requirement of 1.15 billion gallons equals the 0.5 billion gallon requirement for 2009 plus the 0.65 billion gallon requirement for 2010. Cap on Conventional Biofuel = Total Renewable Fuel – Total Advanced Biofuel. The total advanced biofuel requirement equals the sum of cellulosic biofuel and biomass-based diesel (both of which have annual volume targets provided in statute and are identified in **Table 1** in italics) plus other advanced biofuel (which does not have an annual volume target provided in statute).

a. EPA rescinded the 2011 cellulosic biofuel standard.

b. RFS Final Rule 2012, *Federal Register*, January 9, 2012. Subsequently vacated under American Petroleum Institute v. EPA, D.C. Cir., No. 12-1139, 1/25/13.

c. The D.C. Circuit Court vacated EPA's 2016 total renewable fuel volume requirement and remanded the 2015 final rule to EPA for reconsideration. Americans for Clean Energy v. EPA, No. 16-1005, 2017 U.S. App. LEXIS 13692, at *4-5 (D.C. Cir. July 28, 2017).

d. The 2021 final volume requirement for biomass-based diesel is 2.43 billion gallons.

e. The EPA Administrator is to consult with the Secretaries of Energy and Agriculture and take into account an analysis of certain factors to determine the volume amounts. 42 U.S.C. §7545(o)(2)(B)(ii).

f. Proposed retroactive modification of 2020 final volume requirements.

g. Supplemental standard of 250 million gallons proposed for 2022 to partially address court remand of 2016 standard. EPA reports it intends to propose an additional supplemental volume of 250 million gallons for 2023 in a subsequent action. U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72457, December 21, 2021.

RFS Implementation Issues

Implementation of the RFS has been complex, and compliance with some of its parts has been challenging, according to some stakeholders. This section briefly explains some of the general concerns and challenges with implementing the RFS.

Administering Agency

EPA administers the RFS.[47] This responsibility includes evaluating renewable fuel pathways eligible for the RFS.[48] In addition, EPA is required to evaluate the ability of the biofuel industry to produce enough fuel to meet the annual volume standard, release an annual volume standard based on its research findings,[49] and ensure that annual compliance by obligated parties is met.

[47] Although the RFS is administered by EPA, programs under other federal departments may indirectly assist biofuel production that may be used to meet the mandate. For example, the U.S. Department of Agriculture (USDA) provides resources and support for biofuel feedstock development and supply, biofuel infrastructure development, advanced biofuel production, and more (e.g., Rural Energy for America Program, Advanced Biofuel Payment Program, and Higher Blends Infrastructure Investment Program). For more information on energy programs administered by USDA, see CRS Report R45943, *The Farm Bill Energy Title: An Overview and Funding History*, by Kelsi Bracmort.

[48] A fuel pathway consists of three components: a biomass feedstock, a biofuel production process, and a fuel type (e.g., ethanol made from corn starch using a dry mill production process). The fuel pathway is assigned to a renewable fuel category (known by its D code provided in Table 1 of 40 C.F.R. §80.1426 in the RFS regulations) which signifies which RIN the biofuel is eligible for to be in compliance with the RFS. EPA maintains a list of approved fuel pathway and fuel pathway petitions on its website (https://www.epa.gov/renewable-fuel-standard-program/approved-pathways-renewable-fuel).

[49] Frequently, EPA has approved annual standards for some biofuels different from what was originally scheduled in statute.

All of the above must be completed annually, taking into consideration comments from other government agencies and the public and directives from court decisions. These responsibilities could be viewed as an addition to EPA's regulatory workload and have required EPA to develop new capabilities to carry them out.

In the years following the 2010 issuance of the amended RFS final rule,[50] EPA has used its waiver authorities to set annual volume requirements for cellulosic biofuel, total advanced biofuel, and total renewable fuel below the amounts stated in the statute.[51] Legal challenges have been brought against the EPA regarding some of these annual fuel volume requirements and the projections on which they were based. For instance, the American Petroleum Institute objected to EPA's 2012 cellulosic biofuel production projection methodology, among other things, and challenged it in court. The federal court vacated the 2012 cellulosic biofuel standard and provided principles for EPA to apply to future annual projections.[52] Likewise, Americans for Clean Energy and other petitioners challenged various aspects of the final rule that set the volume requirements and projections for 2014-2016 and 2017 for biomass-based diesel, including EPA's interpretation of "inadequate domestic supply" in exercising its general waiver authority to reduce the total volume requirements. The D.C. Circuit held that EPA's interpretation of "inadequate domestic supply" was not reasonable and that EPA had improperly exercised its waiver authority as a result. It vacated EPA's 2016 total renewable fuel volume requirement and remanded the final rule to EPA for reconsideration consistent with the court's decision.[53]

In some instances, the timing of EPA's RFS regulatory actions, such as the annual announcement of the renewable fuel volume requirements, has not met statutory deadlines. The more recent final rules generally adhere to the statutory schedule.[54] However, some of the earlier final rules did not meet the statutory deadline.[55] A lack of timely rulemaking combined with inaccurate volume projections could affect private investment, according to some advanced biofuel producers.[56] Additionally, the amount of time it takes the agency to approve new fuel pathways and register new facilities has been raised in public comments to proposed RFS rules.[57] Slow approval could potentially stifle investment and production of new fuels. Further, prolonged processing time for some program enhancement rules—such as the proposed Renewables Enhancement and Growth Support rule (REGS rule)—may impede the growth of the program.[58]

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[50] EPA, "Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule," 75 *Federal Register* 14670, March 26, 2010.

[51] For more discussion, see CRS Report R44045, *The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes*, by Kelsi Bracmort.

[52] American Petroleum Institute v. EPA, 706 F.3d 474 (D.C. Cir. 2013). More discussion of this legal challenge is in CRS Report R41106, *The Renewable Fuel Standard (RFS): Cellulosic Biofuels*, by Kelsi Bracmort.

[53] Americans for Clean Energy v. EPA, 864 F.3d 691, 737 (D.C. Cir. 2017).

[54] Under the Clean Air Act, each year's standards are required to be announced by November 30 of the previous year.

[55] EPA's late announcement of the annual requirements 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.

[56] Written statement by Nebraska Governor Pete Ricketts, Chairman, Governors' Biofuels Coalition, *U.S. Environment Protection Agency, Public Hearing, Proposed Renewable Fuel Standard Program: Standards for 2018 and Biomass-Based Diesel Volume for 2019*, Washington, DC, August 1, 2017.

[57] EPA, *Renewable Fuel Standard Program—Standards for 2020 and Biomass-Based Volume for 2021: Response to Comments*, EPA-420-R-19-018, December 2019.

[58] EPA issued the proposed REGS rule in November 2016. The REGS rule would modify RFS program regulations to increase production of cellulosic and other advanced biofuels, among other things. EPA requested comment on multiple provisions of the proposed REGS rule in the 2020 RFS proposed rule and finalized some of those provisions in the 2020 final rule. It is not clear when EPA will act on those provisions not finalized in the 2020 final rule.

Lastly, EPA has the authority to "reset" the RFS. The "reset" authority allows the EPA Administrator to adjust the applicable volumes of the RFS for future years starting in 2016 if certain conditions are met.[59] EPA reports in the proposed rule to set 2020, 2021, and 2022 volumes that the "reset" provision for the RFS has been triggered for three of the four renewable fuel categories identified in statute.[60] EPA reports the "conditions for resetting cellulosic biofuel volumes were met by the 2010 annual standard, which reduced the applicable cellulosic biofuel volume by at least 50 percent."[61] EPA reports the "conditions for resetting advanced biofuel volumes were met by the 2014 and 2015 annual standards, which reduced the applicable advanced biofuel volume by at least 20 percent for two consecutive years."[62] And, EPA reports the "conditions for resetting total renewable fuel volumes were met by the 2018 and 2019 annual standards, which reduced the applicable total renewable fuel volume by at least 20 percent for two consecutive years."[63] How EPA implements this provision likely will affect renewable fuel production and compliance with the overall program.[64]

Qualifying Biofuels

As noted above, there are a number of nested categories within the RFS; a fuel may qualify as a biofuel for one or more portions of the mandate.[65] Difficulty by some advanced biofuel producers in understanding which advanced biofuels qualify for the RFS can lead to challenges in determining how compliance is being met.[66]

Not all fuels from a renewable source are eligible under the RFS. The RFS operates as a biofuel standard, with priority assigned to liquid transportation fuels from biomass feedstocks.[67] Other renewable sources (e.g., wind) do not qualify. Before a fuel can generate RFS RINs, however, that fuel pathway must be approved by EPA; according to advanced biofuel producers, that

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Additionally, in the 2020, 2021, and 2022 proposed rule, EPA is requesting comment on the use of biointermediates which was also discussed in the REGS rule. U.S. Environmental Protection Agency, "Renewables Enhancement and Growth Support Rule: Proposed Rule," 81 *Federal Register* 80828, November 16, 2016; U.S. Environmental Protection Agency, "Renewable Fuel Standard Program: Standards for 2020 and Biomass-Based Diesel Volume for 2021 and Other Changes," 85 *Federal Register* 7016, February 6, 2020; U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72465, December 21, 2021.

[59] For more discussion of the reset provision, see CRS Report R44045, *The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes*, by Kelsi Bracmort.

[60] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72442, December 21, 2021.

[61] Ibid.

[62] Ibid.

[63] Ibid.

[64] In the 2020, 2021, and 2022 proposed rule, EPA proposes to use both the cellulosic waiver authority and the reset authority to set the 2020, 2021, and 2022 volume requirements.

[65] Approved RFS fuels and feedstocks are provided by EPA at https://www.epa.gov/renewable-fuel-standard-program/approved-pathways-renewable-fuel.

[66] 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*, by Kelsi Bracmort.

[67] In July 2014, EPA approved new cellulosic and advanced biofuel pathways to include the production of compressed natural gas, liquefied natural gas, and electricity from biogas from landfills, municipal waste-water treatment facility digesters, agricultural digesters, and separated municipal solid waste digesters. Compliant fuels for the RFS also include heating oil and jet fuel. See EPA, "Regulation of Fuels and Fuel Additives: RFS Pathways II, and Technical Amendments to the RFS Standards and E15 Misfueling Mitigation Requirements; Final Rule," 79 *Federal Register* 138, July 18, 2014. EPA, "Regulation of Fuels and Fuel Additives: Modifications to Renewable Fuel Standard Program – Final Rule," 78 *Federal Register* 62462, October 22, 2013.

process can take a considerable amount of time for some fuels.[68] EPA reports it has approved over 100 facility-specific pathway petitions since 2010.[69] As of January 2022, EPA reports there are 23 pending pathway petitions.[70]

Lastly, some may view the RFS as a biofuel production mandate. The statutory language does not mandate the production of biofuels; rather, it mandates the use of biofuel. However, it could be argued that it is difficult to use a fuel that is not being produced and that the RFS therefore indirectly creates a demand for certain biofuels and thus stimulates their production.

Cellulosic Biofuel Production

By statute, cellulosic biofuel is targeted to comprise approximately 44% of the total renewable fuel mandate in 2022. However, the annual cellulosic biofuel volume target established by Congress is not being met. Actual cellulosic biofuel production volumes (e.g., cellulosic ethanol) are below the expectations set when the law was passed. The statute contains a cellulosic biofuel waiver authority that, in short, allows the EPA Administrator to reduce the cellulosic biofuel mandate when the projected production capacity for a given year is less than the volume required in the statute.[71] For instance, in 2020, the statute requires 10.5 billion gallons of cellulosic biofuel. EPA set the 2020 target volume at 590 million gallons for 2020, and, in its latest proposed rule, EPA proposes to retroactively set the cellulosic biofuel requirement at 510 million gallons. This gap is due to several factors, including lack of private investment, logistical challenges, technology setbacks, and uneven support from the federal government.[72] These factors, coupled with the fact that annual volumes in the statute were established when market conditions for raising investment capital for new biofuel technologies were more favorable, may suggest unrealistic targets for some advanced biofuels. These production limitations have raised questions about whether the statutory cellulosic biofuel volumes are attainable.

Blend Wall

The "blend wall" is a term used to describe 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 other provisions of the Clean Air Act. The blend wall has been viewed by many to be in direct conflict with the biofuel volumes mandated in the RFS.[73] Thus far, the largest volume being met under the RFS is for the implied conventional biofuel segment of the mandate, met mainly with corn starch ethanol blended into gasoline. Due to a variety of factors (e.g., automaker warranty coverage, fueling station infrastructure, etc.), ethanol content in gasoline is generally limited to 10% (E10).

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[68] Biotechnology Innovation Organization, "2018 RFS Volumes Set Back Growth in Cellulosic Biofuels," press release, November 30, 2017, https://www.bio.org/press-release/2018-rfs-volumes-set-back-growth-cellulosic-biofuels; "BIO Encourages EPA to Speed Approvals of New Biofuel Pathways," *Business Wire*, March 31, 2014, https://www.businesswire.com/news/home/20140331006205/en/BIO-Encourages-EPA-Speed-Approvals-New-Biofuel.

[69] U.S. Environmental Protection Agency, "Renewable Fuel Standard Program: Standards for 2020 and Biomass-Based Diesel Volume for 2021 and Other Changes," 85 *Federal Register* 7057, February 6, 2020.

[70] U.S. Environmental Protection Agency, *Pending Petitions for Renewable Fuel Pathways*, January 5, 2022, https://www.epa.gov/renewable-fuel-standard-program/pending-petitions-renewable-fuel-pathways.

[71] 42 U.S.C. 7545(0)(7)(D).

[72] For more discussion, see CRS Report R41106, *The Renewable Fuel Standard (RFS): Cellulosic Biofuels*, by Kelsi Bracmort.

[73] For more discussion, see CRS Report R40445, *Intermediate-Level Blends of Ethanol in Gasoline, and the Ethanol "Blend Wall"*, by Kelsi Bracmort.

With a relatively fixed supply of gasoline, the amount of ethanol that can be supplied this way is also limited.

In the past, under economic conditions at that time (i.e., 2018 and 2019), the blend wall was a concern to some, but it may not have been as significant an impediment to immediate fuel consumption as previously considered.[74] In December 2019, EPA reported "the E10 blend wall is not the barrier that some commenters believe it to be."[75] However, a significant reduction in gasoline consumption would likely require a reduction in the amount of ethanol needed to be blended into the gasoline. More recently, the U.S. Energy Information Administration (EIA) reports that 2020 U.S. motor gasoline consumption decreased to its lowest level since 1997, mainly due to responses to the COVID-19 pandemic.[76] EIA also reports that ethanol production changes followed motor gasoline production changes—particularly at the beginning of the COVID-19 pandemic.[77] EPA proposes to respond to these 2020 decreases, in part, by retroactively adjusting "the 2020 volumes and standards to reflect the actual volumes of renewable fuels and transportation fuel consumed in the U.S."[78] It is not clear how long the COVID-19 pandemic will last and how the pandemic may affect future motor gasoline consumption. Thus, it is difficult to determine what future impacts COVID-19 could potentially have on the blend wall and RFS compliance, among other things.

There are some possible approaches that could alleviate blend wall concerns. One option is to blend higher levels of ethanol into conventional gasoline. In 2011, EPA granted a Clean Air Act waiver that allows gasoline to contain up to 15% ethanol for use in model year 2001 and newer light-duty motor vehicles.[79] However, limited demand, legal constraints limiting E15 sales to winter months, and infrastructure and automobile warranty concerns have precluded widespread offering and purchase of E15. Nonetheless, widespread use of E15 could potentially postpone the blend wall for some time.

Another option to address the blend wall would be increasing the use of ethanol in flexible-fuel vehicles capable of using E85, a gasoline-ethanol blend containing 51% to 83% ethanol.[80]

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[74] Sen. James M. Inhofe, "Inhofe, Senators Urge RFS Policy to Reflect Market Realities," press release, May 1, 2019; Renewable Fuels Association, "DOE Data Show 31 States Broke Through So-Called 'Blend Wall' in 2016," press release, February 2, 2018, https://ethanolrfa.org/2018/02/doe-data-show-31-states-broke-called-blend-wall-2016/.

[75] EPA, *Renewable Fuel Standard Program—Standards for 2020 and Biomass-Based Volume for 2021: Response to Comments*, EPA-420-R-19-018, December 2019.

[76] U.S. Energy Information Administration, *U.S. Petroleum Consumption Decreased to a 25-Year Low in 2020*, August 5, 2021. U.S. Energy Information Administration (EIA) data for motor gasoline supply shows a steep decline in late March 2020. U.S. Energy Information Administration, *Weekly U.S. Product Supplied of Finished Motor Gasoline*, January, 10, 2022, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WGFUPUS2&f=W.

[77] U.S. Energy Information Administration, *U.S. Fuel Ethanol Production and Inventory Changes Have Largely Followed Motor Gasoline*, June 8, 2020.

[78] U.S. Environmental Protection Agency, "Renewable Fuel Standard (RFS) Program: RFS Annual Rules," 86 *Federal Register* 72438, December 21, 2021.

[79] For more information, see U.S. Environmental Protection Agency, *Ethanol Waivers (E15 and E10)*, April 1, 2020, https://www.epa.gov/gasoline-standards/ethanol-waivers-e15-and-e10. In 2019, EPA issued a final rule allowing year-round E15 sales. For more discussion, see CRS Insight IN10979, *Year-Round Sale of E15*, by Kelsi Bracmort. In 2021, the rule was vacated by the U.S. Court of Appeals for the District of Columbia Circuit. *American Fuel & Petrochemical Manufacturers v. Environmental Protection Agency*, USCA Case #19-1124 (United States Court of Appeals for the District of Columbia Circuit 2021).

[80] The U.S. Department of Energy (DOE) reports that as of 2018 there were more than 21 million FFV in the United States. U.S. Department of Energy Alternative Fuels Data Center, *Flexible Fuel Vehicles*, January 10, 2022. The U.S. Department of Transportation reports there were 250.7 million light-duty vehicles in the United States in 2018. U.S. Department of Transportation Bureau of Transportation Statistics, *Number of U.S. Aircraft, Vehicles, Vessels, and*

However, there are infrastructure constraints with the use of E85. For example, the number of E85 fueling stations is limited.[81] There are government infrastructure initiatives aimed at increasing the availability of E15 and other higher ethanol-gasoline blends. For example, the U.S. Department of Agriculture (USDA) administers the Higher Blends Infrastructure Incentive Program (HBIIP), with an overall goal to increase the sales and use of higher blends of ethanol and biodiesel.[82] USDA reports the program will do this, in part, by "sharing the costs related to and/or offering sales incentives for the installation of fuel pumps, related equipment, and infrastructure."[83]

Other Factors

The RFS is not a stand-alone program. The implementation and impacts of the program are affected by many factors that are not easily predicted or controlled. For example, cellulosic biofuel production, at a minimum, requires conversion technology, which itself requires technical expertise and time to ramp up to commercial scale. The large quantity of biomass feedstocks needed to produce such biofuels requires factors such as appropriate weather conditions and an expectation of stable markets for feedstock commodities. Further, some types of biofuel production thus far have been sensitive to the availability of tax incentives in order to be economically feasible (e.g., biodiesel).[84] Unexpected occurrences (e.g., drought, failed technology, tax incentive expiration, trade disputes) could potentially impact an entire industry, especially for some advanced biofuels in nascent industries compared to conventional transportation fuels.

Congressional Issues

The RFS was established in 2005 at a time when Congress foresaw the need to diversify the country's energy portfolio, strengthen the economy of rural communities that could contribute to biofuel production, bolster U.S. standing in an emerging segment of the energy technology market, and protect the environment, among other objectives. The RFS was subsequently expanded in 2007. Since then, some components of the RFS (e.g., corn starch ethanol, biomass-based diesel) have progressed steadily toward meeting statutory requirements and other components (e.g., cellulosic biofuel) have not.

There has been perennial legislative interest, executive activity, and litigation regarding the RFS. Several factors have led to congressional interest in the RFS—including the statutory requirements, the implementation process, stakeholder interests, complementary programs, actions of federal agencies, and agricultural trade issues, among other things. Further, the RFS is a program with elements and objectives that are interpreted differently by the parties that must abide by the underlying statute.

Other Conveyances, January 10, 2022.

[81] The U.S. Department of Energy reports there were 4,121 E85 fueling stations as of January 2022. U.S. Department of Energy, *Ethanol Fueling Station Locations*, January 10, 2022, https://afdc.energy.gov/fuels/ethanol_locations.html#/analyze?fuel=E85.

[82] For more information about HBIIP, see the HBIIP website at https://www.rd.usda.gov/hbiip.

[83] U.S. Department of Agriculture, "Announcement of Future Competitive Grant Funds Availability for Higher Blends Infrastructure Incentive Program (HBIIP) for Fiscal Year 2020," 85 *Federal Register* 11946, February 28, 2020.

[84] For example, see U.S. Energy Information Administration, *U.S. Biomass-Based Diesel Tax Credit Renewed Through 2022 in Government Spending Bill*, January 28, 2020.

Congress may consider the following RFS items (in no particular order) as it continues to debate the merits and challenges of the RFS:

- **Timing.** 2022 is the last year that the RFS program has annual volumes contained in statute. After 2022, the EPA Administrator determines the annual volume amounts.
- **Reset.** The EPA Administrator has the authority to modify the volume requirements for future years for the total renewable fuel, advanced biofuel, and cellulosic biofuel categories if certain statutory criteria are met. (EPA has proposed using this authority for 2020 through 2022.)
- **Fuel pathways.** Fuel pathways must be approved by EPA in order for a fuel to be eligible for the RFS. The time it takes and the resources EPA has to approve the pathways are unclear.
- **Volume targets.** The statutory targets have not been met for the last several years for three of the four fuel categories: renewable fuel, advanced biofuel, and cellulosic biofuel. The statutory target for biomass-based diesel has been met as has the implied target for conventional biofuel.
- **Environmental impact.** EPA is to provide Congress with a report every three years that assesses the impact of the RFS on environmental issues and resource conservation issues, among other things.[85] There are various perspectives about the environmental impact of the RFS.[86]
- **RFS compliance.** A tradeable credit system is used to ensure obligated parties comply with the RFS. At times, the availability and cost of the credits (i.e., RINs) and the transparency of the market have been a concern to some.[87]
- **Small refinery exemptions.** Small refineries may petition the EPA Administrator for an exemption from the RFS mandate if they can prove compliance would subject them to disproportionate economic hardship.[88] Some Members of Congress question how EPA evaluates the petitions and how EPA accounts for such exemptions, among other things.

[85] In 2021, EPA reported that "[t]he Third Triennial Report to Congress is under development and scheduled to be provided to Congress in 2021." U.S. Environmental Protection Agency, *Energy and the Environment Research*, January 10, 2022, https://www.epa.gov/air-research/energy-and-environment-research. EISA Section 204. U.S. Environmental Protection Agency, *Biofuels and the Environment: The Second Triennial Report to Congress*, EPA/600/R-18/195, June 29, 2018. U.S. Environmental Protection Agency, *Biofuels and the Environment: First Triennial Report to Congress*, EPA/600/R-10/183F, December 2011.

[86] U.S. Government Accountability Office, *Renewable Fuel Standard: Information on Likely Program Effects on Gasoline Prices and Greenhouse Gas Emissions*, GAO-19-47, May 2019; Clean Air Task Force, *EPA's Report on the Environmental Impacts of Biofuels*, July 9, 2018; Biotechnology Innovation Organization, *New Study: Biofuel Use Saved 589.3 Million Tons of Carbon Emissions over the Past Decade*, August 24, 2015.

[87] For more information, see U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Environment, *Background on Renewable Identification Numbers under the Renewable Fuel Standard*, Testimony of Brent Yacobucci, 115th Cong., July 25, 2018.

[88] For more information on small refinery exemptions, see CRS Report R46244, *The Renewable Fuel Standard (RFS): Frequently Asked Questions About Small Refinery Exemptions (SREs)*, by Kelsi Bracmort.

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