



Report to the Chairman, Subcommittee
on Regulatory Affairs and Federal
Management, Committee on Homeland
Security and Governmental Affairs,
U.S. Senate

November 2016

RENEWABLE FUEL STANDARD

Program Unlikely to
Meet Its Targets for
Reducing
Greenhouse Gas
Emissions

GAO Highlights

Highlights of [GAO-17-94](#), a report to the Chairman, Subcommittee on Regulatory Affairs and Federal Management, Committee on Homeland Security and Governmental Affairs, U.S. Senate

Why GAO Did This Study

The RFS generally mandates that domestic transportation fuels be blended with increasing volumes of biofuels through 2022, with the goals of reducing greenhouse gas emissions and expanding the nation's renewable fuels sector while reducing reliance on imported oil. Annual targets for the volumes of biofuels to be blended are set by statute. EPA oversees the program and is responsible for adjusting the statutory targets through 2022 to reflect expected U.S. industry production levels, among other factors, and for setting biofuel volume targets after 2022. Biofuels included in the RFS are conventional (primarily corn-starch ethanol) as well as various advanced biofuels (including cellulosic ethanol and biomass-based diesel). Advanced biofuels emit fewer greenhouse gases than petroleum and corn-starch ethanol.

GAO was asked to review challenges to the RFS and their possible solutions. This report provides information on whether the RFS is expected to meet its goals, as well as expert views on any federal actions that could improve the RFS framework, among other things. GAO worked with the National Academy of Sciences to identify experts on issues related to the RFS. GAO interviewed these experts and analyzed their responses. This report also drew on published studies, and a companion report, [GAO-17-108](#), that examined federal research and development in advanced biofuels and related issues. EPA generally agreed with the report.

View [GAO-17-94](#). For more information, contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov.

November 2016

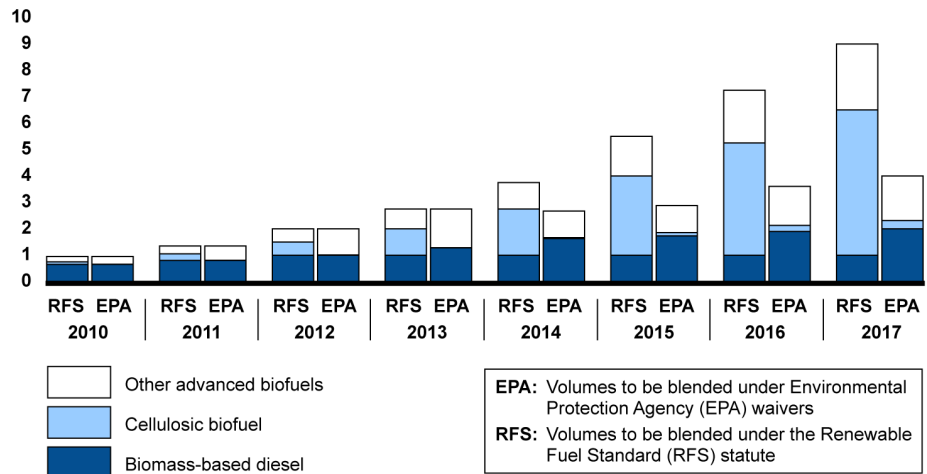
RENEWABLE FUEL STANDARD

Program Unlikely to Meet Its Targets for Reducing Greenhouse Gas Emissions

What GAO Found

It is unlikely that the goals of the Renewable Fuel Standard (RFS)—reduce greenhouse gas emissions and expand the nation's renewable fuels sector—will be met as envisioned because there is limited production of advanced biofuels to be blended into domestic transportation fuels and limited potential for expanded production by 2022. Advanced biofuels achieve greater greenhouse gas reductions than conventional (primarily corn-starch ethanol), while the latter accounts for most of the biofuel blended under the RFS. As a result, the RFS is unlikely to achieve the targeted level of greenhouse gas emissions reductions. For example, the cellulosic biofuel blended into the transportation fuel supply in 2015 was less than 5 percent of the statutory target of 3 billion gallons. In part as a result of low production, EPA has reduced the RFS targets for advanced biofuels through waivers in each of the last 4 years (see figure). According to experts GAO interviewed, the shortfall of advanced biofuels is the result of high production costs, and the investments in further research and development required to make these fuels more cost-competitive with petroleum-based fuels even in the longer run are unlikely in the current investment climate.

Volumes of Advanced Biofuels to Be Blended into Domestic Transportation Fuel, as Set by the Renewable Fuel Standard Statute and by EPA, 2010 through 2017
Billions of gallons



Source: GAO analysis of legal requirements and EPA data. | GAO-17-94

Note: As of September 2016, EPA volumes for 2017 are proposed, except for the biomass-based diesel volume for 2017, which is final.

Experts cited multiple federal actions that they suggested could incrementally improve the investment climate for advanced biofuels. For example, some experts told GAO that maintaining a consistent tax credit for biofuels, rather than allowing it to periodically lapse and be reinstated, could reduce uncertainty and encourage investment in advanced biofuels.

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Abbreviations

DOE	Department of Energy
EISA	Energy Independence and Security Act of 2007
EMTS	EPA Moderated Transaction System
EPA	Environmental Protection Agency
LCFS	Low carbon fuel standard
RFS	Renewable Fuel Standard
RIN	Renewable identification number
USDA	U.S. Department of Agriculture

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November 28, 2016

The Honorable James Lankford
Chairman
Subcommittee on Regulatory Affairs and Federal Management
Committee on Homeland Security and Governmental Affairs
United States Senate

Dear Mr. Chairman:

Since 2006, the Renewable Fuel Standard (RFS) has required that transportation fuels—typically gasoline and diesel—sold in the United States contain annually increasing amounts of renewable fuels, such as ethanol and biodiesel, to achieve key environmental and energy goals.¹ However, renewable fuels production has not grown to the statutory targets. The Environmental Protection Agency (EPA), which is responsible for implementing the RFS, defines the goals of the RFS as to (1) reduce greenhouse gas emissions and (2) expand the nation’s renewable fuel (or biofuel) sector while reducing reliance on imported oil. In addition, many experts and industry stakeholders agree that the RFS has an implicit purpose of supporting the domestic agricultural economy. Each year, by November 30, EPA is required to establish via rulemaking the volumes of biofuel that must be blended with transportation fuels during the following calendar year (volume requirement).² The statute provides EPA with waiver authority to set volumes below the targets specified in the statute under certain circumstances, such as when there is “inadequate domestic supply.”³

Our past work has shown that implementation of the RFS faces many challenges. In June 2011, we found that problems with transporting, selling, and using gasoline blended with more than 10 percent ethanol created challenges to meeting the volumes in the statute.⁴ For example,

¹The RFS was established by the Energy Policy Act of 2005, Pub. L. No. 109-58 (2005), and expanded in 2007 by the Energy Independence and Security Act, Pub. L. No. 110-140 (2007). The current statutory requirements are codified at 42 U.S.C. § 7545(o).

²42 U.S.C. § 7545(o)(3)(B).

³42 U.S.C. § 7545(o)(7).

⁴GAO, *Biofuels: Challenges to the Transportation, Sale, and Use of Intermediate Ethanol Blends*, [GAO-11-513](#) (Washington, D.C.: June 3, 2011).

we found that these higher ethanol blends may require costly infrastructure improvements, such as replacing of underground storage tanks at filling stations. In March 2014, we found that EPA had been late in setting most annual RFS volume requirements for 2009 through 2014, adding to investment uncertainty for refiners and other market participants.⁵ We recommended that EPA develop a plan to address these delays. Subsequently, EPA set the volume requirement for 2016 on time and is on schedule to finalize the proposed volume requirement for 2017. However, some of the volume requirements that EPA has set and proposed have been controversial among RFS stakeholders. For example, agricultural groups have stated in public comments that EPA should further increase volumes of conventional corn-starch ethanol—the biofuel predominantly used in the United States—to encourage investment in the infrastructure needed to accommodate fuel blends with a higher percentage of ethanol. In contrast, petroleum industry representatives have stated that increasing these volume requirements is unrealistic because there is insufficient demand for higher ethanol blends, and small engine manufacturers have stated that EPA is increasing ethanol volumes to levels dangerous to boat engines and small engines, such as those in lawn mowers.

You asked us to provide information about the RFS, the challenges to its implementation, and possible solutions or policy alternatives. This report provides information on (1) whether the RFS is expected to meet its goals, (2) expert views on any federal actions that could improve the RFS framework, and (3) policy alternatives experts suggested to better meet the goals of the RFS in the future.

To address our objectives, we contracted with the National Academy of Sciences for a list of experts on issues related to the RFS. The National Academy of Sciences identified 24 experts with whom we conducted semistructured interviews. We analyzed the content of the experts' responses to our questions, coding their responses into categories pertinent to our objectives.⁶ In addition, we reviewed the public comments from stakeholders on rules proposed by EPA in 2015 and 2016, relevant

⁵GAO, *Petroleum Refining: Industry's Outlook Depends on Market Changes and Key Environmental Regulations*, [GAO-14-249](#) (Washington, D.C.: Mar. 14, 2014).

⁶For reporting purposes, we categorized expert responses as follows: "nearly all" experts represents 21 to 23 experts; "most" experts represents 16 to 20 experts; "many" experts represents 11 to 15 experts; "several" experts represents 6 to 10 experts; and "some" experts represents 2 to 5 experts.

legislation, and agency documents pertaining to annual volume requirements (e.g., EPA's response to public comments) and conducted a literature search of academic articles analyzing the RFS and other policy approaches. We also interviewed Congressional Research Service officials who have conducted extensive work on the RFS.⁷ In addition, we interviewed officials at EPA, the Department of Energy (DOE), and the Department of Agriculture (USDA). Finally, this report drew from a companion report, [GAO-17-108](#), that examined federal research and development in advanced biofuels and related issues.⁸

We conducted this performance audit from June 2015 to November 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

In response to concerns about the nation's dependence on imported oil, Congress enacted the RFS program as part of the Energy Policy Act of 2005. This initial RFS required that a minimum of 4 billion gallons of biofuels be used in 2006, rising to 7.5 billion gallons by 2012. Two years later, the Energy Independence and Security Act of 2007 (EISA) expanded the biofuel target volumes and extended the ramp-up through 2022 establishing overall target volumes for biofuels that increase from 9 billion gallons in 2008 to 36 billion gallons in 2022. The EISA volumes can

⁷See, for example, Congressional Research Service, *The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes*, R44045 (Washington, D.C.: Feb. 10, 2016); *The Renewable Fuel Standard (RFS): In Brief*, R43325 (Washington, D.C.: Feb. 4, 2016); *Analysis of Renewable Identification Numbers (RINs) in the Renewable Fuel Standard (RFS)*, R42824 (Washington, D.C.: July 22, 2013); *The Renewable Fuel Standard (RFS): Compliance and Penalties* (Washington, D.C.: Feb. 5, 2015); and *Renewable Fuel Standard (RFS): Overview and Issues*, R40155 (Washington, D.C.: Nov. 22, 2013).

⁸GAO, *Renewable Fuel Standard: Low Expected Production Volumes Make It Unlikely That Advanced Biofuels Can Meet Increasing Targets*, [GAO-17-108](#), (Washington, D.C.: Nov. 23 2016).

be thought of in terms of two broad categories: conventional and advanced biofuels.⁹

Conventional biofuel: Biofuels from new facilities must achieve at least a 20-percent reduction in greenhouse gas emissions, relative to 2005 baseline petroleum-based fuels. The dominant biofuel produced to date is conventional corn-starch ethanol, although recently some conventional biodiesel has entered the fuel supply.¹⁰

Advanced biofuel: Biofuels, other than ethanol derived from corn starch must achieve at least a 50-percent reduction in life-cycle greenhouse gas emissions, as compared with 2005 baseline petroleum-based fuels. This is a catch-all category that may include a number of fuels, including fuels made from any qualified renewable feedstock that achieves at least a 50-percent reduction in lifecycle greenhouse gas emissions, such as ethanol derived from cellulose, sugar, or waste material. This category also includes the following:

- **Biomass-based diesel:** Advanced biomass-based diesel must have life-cycle greenhouse gas emissions at least 50 percent lower than traditional petroleum-based diesel fuels.
- **Cellulosic biofuel:** Advanced biofuel derived from any cellulose, hemicellulose, or lignin that is derived from renewable biomass must have life-cycle greenhouse gas emissions at least 60 percent lower than traditional petroleum-based fuels.¹¹ This category of fuel may include cellulosic ethanol, renewable gasoline, cellulosic diesel, and renewable natural gas from landfills that can be used to generate

⁹The statutory categories are renewable fuel, advanced biofuel, cellulosic biofuel, and biomass-based diesel. Conventional biofuels are defined as renewable fuels that are ethanol derived from corn starch. A fuel may qualify for one or more categories for purposes of meeting the volume requirements. For example, cellulosic biofuel may be used to meet the cellulosic biofuel volume requirement, the advanced biofuel requirement, and the renewable fuel requirement. However, conventional biofuels such as corn-based ethanol count toward meeting only the renewable fuel volume requirement.

¹⁰Corn-starch ethanol plants that were in operation or under construction before December 19, 2007, are not subject to the requirement to reduce greenhouse gas emissions by at least 20 percent.

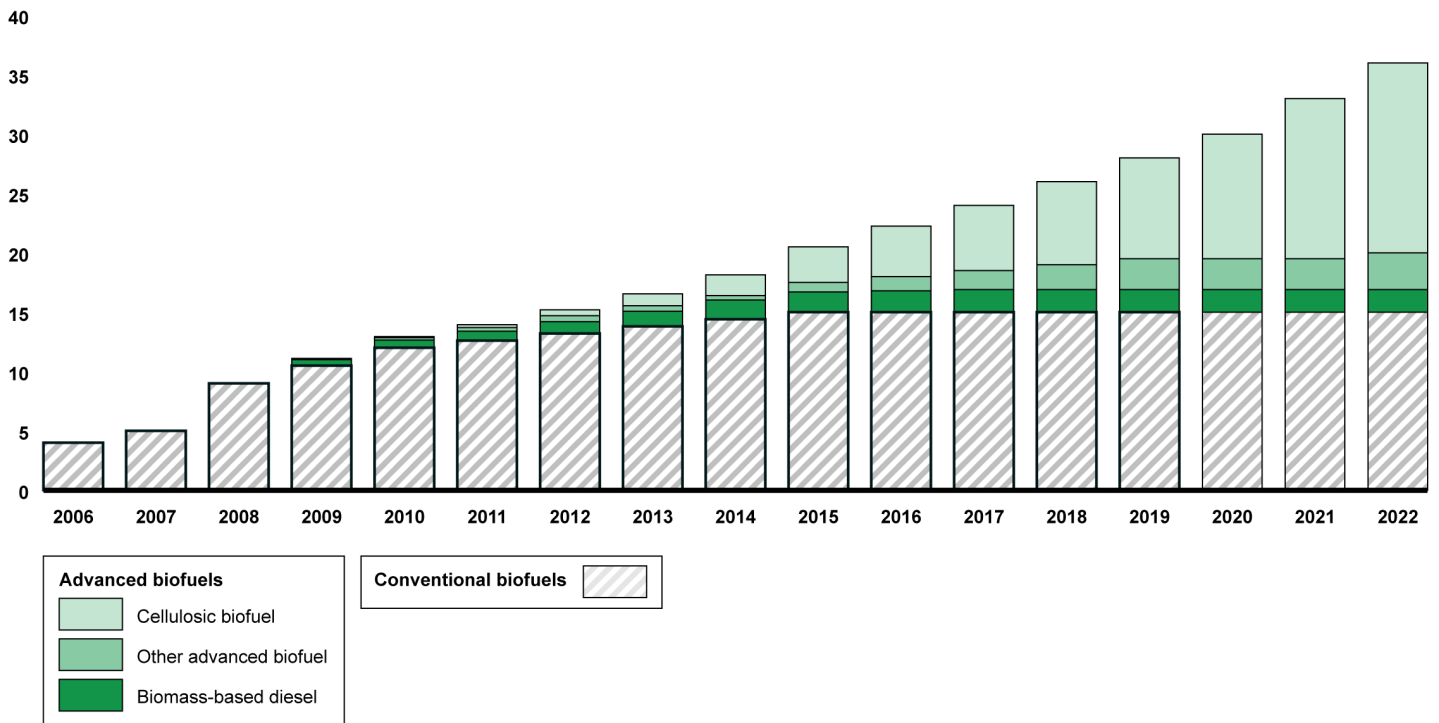
¹¹Plant biomass is made up primarily of cellulose, hemicellulose, and lignin. Cellulose and hemicellulose are made up of potentially fermentable sugars. Lignin provides the structural integrity of plants by enclosing the tightly linked cellulose and hemicellulose molecules, which makes these molecules harder to reach.

electricity for electric vehicles or used in vehicles designed to run on liquefied or compressed natural gas.

The RFS required the annual use of 4 billion gallons of overall biofuels in 2006, rising to 36 billion gallons in 2022, with at least 21 billion gallons from advanced biofuels, effectively capping the volume of biofuels (primarily conventional, or corn-starch, ethanol) that may be counted toward the overall 2022 target of 15 billion gallons.

Figure 1: Statutory Volume Targets under the Renewable Fuel Standard, 2006 through 2022

Renewable Fuel Standard statutory volume (in billions of gallons)



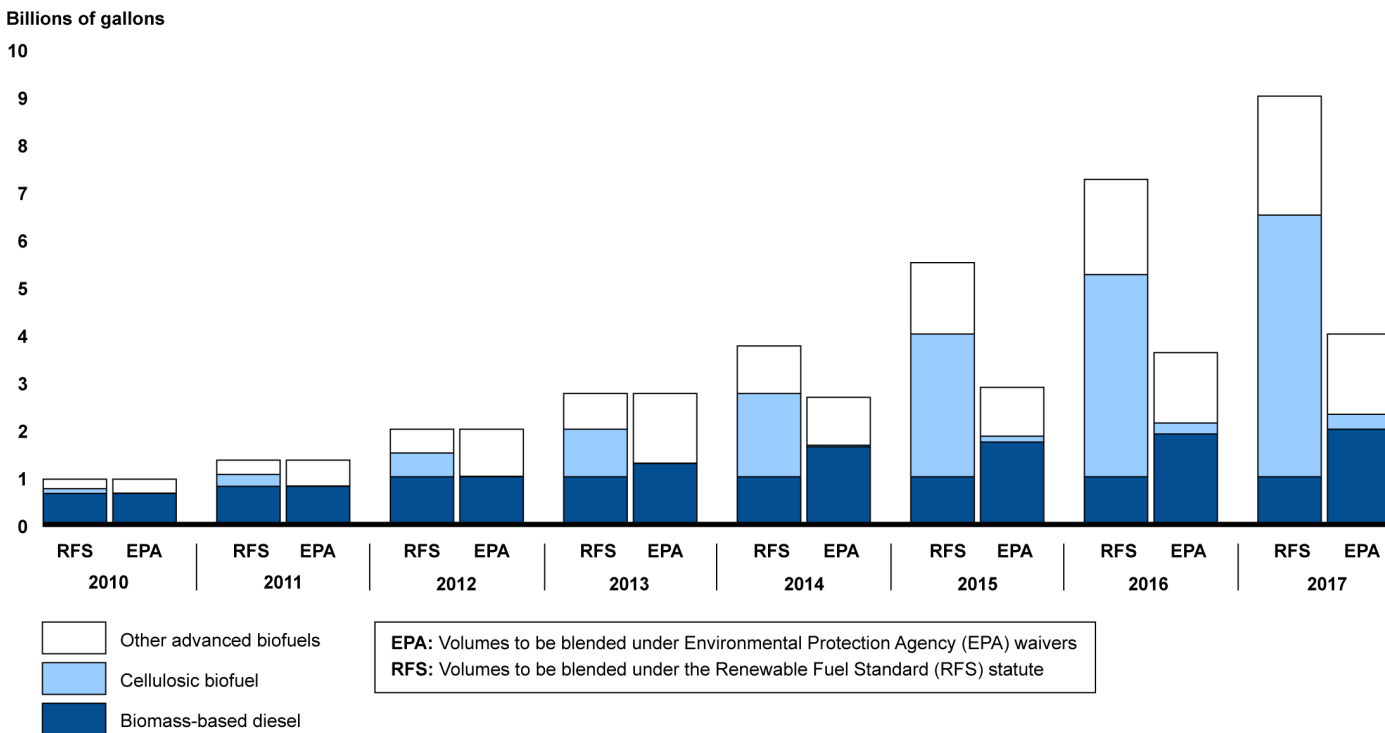
Source: GAO analysis of Environmental Protection Agency Annual Volume Standards and the Energy Independence and Security Act of 2007. | GAO-17-94

Note: Although the figure lists “conventional biofuels” as a separate category, the statute includes conventional biofuels as part of the broader category of “renewable fuel;” thus, other categories of fuels could be used to meet the requirement for this category. The figure illustrates how conventional fuels may be used only up to a point to meet statutory volume targets and that, by 2015, that point would be reached; thus, all additional gallons of renewable fuels would have to come from advanced biofuels.

EPA administers the RFS in consultation with DOE and USDA. EPA’s responsibilities for implementing the RFS include setting annual volume requirements and, in doing so, using its waiver authority to reduce statutory volume targets, if warranted. As figure 1 shows, the structure of

the volume targets allowed for blending of conventional corn-starch ethanol in the early years covered by the statute while providing lead time for the development and commercialization of advanced, and especially cellulosic, biofuels. However, these fuels have not been produced in sufficient quantities to meet statutory targets through 2016. As a result, since 2010, EPA has used its waiver authority to deviate from the statutory target volumes and has reduced the volume requirement for cellulosic biofuel every year, citing inadequate domestic supply, among other things (see fig.2).¹²

Figure 2: Volumes of Advanced Biofuels to Be Blended into Domestic Transportation Fuel, as Set by the Renewable Fuel Standard Statute and by EPA, 2010 through 2017



Source: GAO analysis of legal requirements and EPA data. | GAO-17-94

Note: As of September 2016, EPA volumes for 2017 are proposed, except for the biomass-based diesel volume for 2017, which is final.

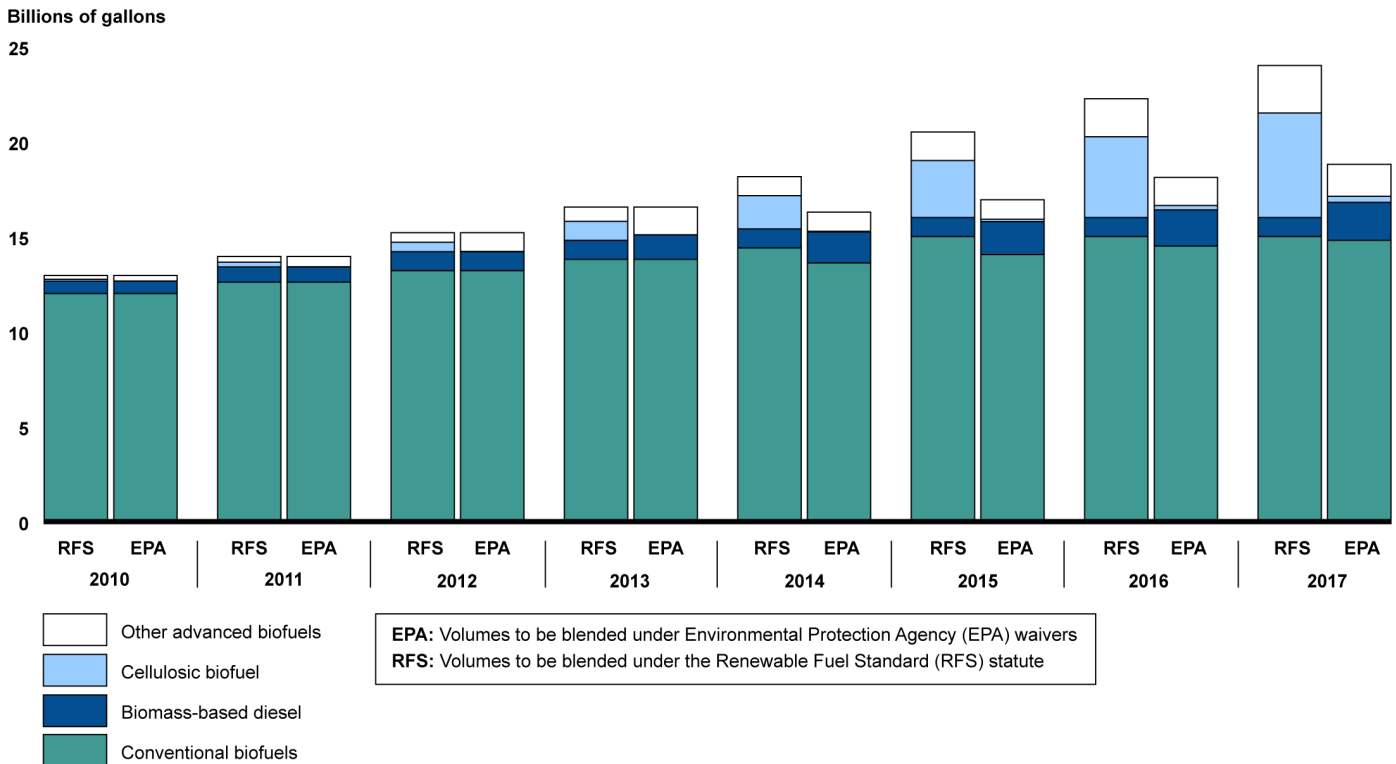
¹²The law provides that for any calendar year for which the projected volume of cellulosic biofuel production is less than the statutory volume, the Administrator of EPA must reduce the applicable volume of cellulosic biofuel to the projected volume available during that calendar year. 42 U.S.C. § 7545(o)(7)(D)(i).

In December 2015—when EPA finalized the volume requirements for 2014, 2015, and 2016—the agency reduced the total renewable fuel requirement for those years.¹³ Effectively, this meant that EPA reduced the amount of conventional biofuels required under the program relative to statutory targets for those years. Similarly, in the volume requirement proposed in May 2016, EPA also proposed reducing the total renewable fuel requirement for 2017 compared with the target volumes in the statute: from 24 to 18.8 billion gallons (see fig.3).¹⁴ In both cases, EPA cited constraints in the fuel market’s ability to accommodate increasing volumes of ethanol. EPA’s use of this waiver authority has been controversial among some RFS stakeholders, and EPA’s 2015 requirement currently faces legal challenges from multiple parties.

¹³In December 2015, when EPA finalized its volume requirement for 2016, it retroactively established volumes for 2014 and 2015. Renewable Fuel Standard Program: Standards for 2014, 2015, and 2016 and Biomass-Based Diesel Volume for 2017; Final Rule, 80 Fed. Reg. 77420 (2015).

¹⁴Renewable Fuel Standard Program: Standards for 2017 and Biomass-Based Diesel Volume for 2018; Proposed Rule, 81 Fed. Reg. 34778 (2016).

Figure 3: Volumes of All Biofuels to Be Blended into Domestic Transportation Fuel, as Set by the Renewable Fuel Standard Statute and by EPA, 2010 through 2017



Source: GAO analysis of legal requirements and EPA data. | GAO-17-94

Note: As of September 2016, EPA volumes for 2017 are proposed, except for the biomass-based diesel volume for 2017, which is final. Although the figure lists “conventional biofuels” as a separate category, the statute includes conventional biofuels as part of the broader category of “renewable fuel”; thus, other categories of fuels could be used to meet the requirement for this category.

EPA’s responsibilities for the RFS also include determining companies’ compliance with the RFS. EPA regulates compliance with the RFS using a credit system. Companies in the United States that refine or import transportation fuel must submit credits—called renewable identification numbers (RIN)—to EPA. Companies with such an obligation are known as “obligated parties.” The number of RINs that an obligated party must submit to EPA is proportional to the volume of gasoline and diesel fuel that the obligated party produces or imports and depends on the total volume requirement EPA sets for the year in question. In accordance with EPA guidelines, a biofuel producer or importer assigns a unique RIN to a gallon of biofuel at the point of production or importation. When biofuels change ownership (e.g., are sold by a producer to a blender), the RINs generally transfer with the fuels. When a gallon of biofuel is blended or

supplied for retail sale, the RIN is separated from the fuel and may be used for compliance or traded, sold, or held for use in the following year. Since biofuels supply and demand can vary over time and across regions, a market has developed for trading RINs. If a supplier has already met its required share and has supplied surplus biofuels for a particular biofuel category, it can sell the extra RINs to another entity or it can hold onto the RINs for future use. An obligated party that faces a RIN deficit can purchase RINs to meet its obligation.¹⁵

Since the establishment of the RFS, conventional corn-starch ethanol is the biofuel that has most often been blended with gasoline. After production, ethanol is blended into the gasoline either by the wholesale distributor or at the retail pump, with both requiring specialized tanks and pumping equipment. Retailers sell specific blends of gasoline and ethanol: E10 (up to 10 percent ethanol); E85 (51 to 85 percent ethanol); and, less typically, E15 (15 percent ethanol). E10 is the most widely used blend, representing the overwhelming majority of gasoline sales in the United States. The E85 blend is specifically used by flex fuel vehicles. Currently, there are relatively few of these automobiles in the United States, and E85 stations are located primarily in the Midwest.¹⁶ The sale of E15 blend is even less common than that of E85. For both E85 and E15, developing retail pump infrastructure has been a focus of USDA's Biofuel Infrastructure Partnership which, beginning in 2015, has made \$100 million available in matching grants in 21 states to install nearly 5,000 new retail pumps.

In the years since the RFS was established, U.S. oil imports have decreased. Several factors contributed to the decrease in reliance on imported oil, including the use of E10 brought about by the RFS. However, other factors contributed more significantly to the decrease. According to an April 2015 DOE report, at the same time that U.S. oil production was growing, U.S. oil consumption, and particularly consumption of gasoline, was falling. A number of factors led to the

¹⁵RINs may be used for RFS compliance in the year they were generated or the following calendar year. No more than 20 percent of the current-year obligation may be met with the previous year's RINs. The EPA Moderated Transaction System (EMTS) is used to register RIN transactions.

¹⁶According to the U.S. Energy Information Administration, in the United States in 2016, there were approximately 19.61 million flex fuel vehicles—designed to use any fuel blend up to E85—compared with 242.55 million total light-duty vehicles.

decrease in consumption, including historic fuel economy standards for light and heavy vehicles in recent years.¹⁷

The RFS Is Expected to Fall Short of Its Targets, Because of Limited Production of Advanced Biofuels and Reliance on Conventional Corn-Starch Ethanol

It is unlikely that the goals of the RFS will be met as envisioned because there is limited production of advanced biofuels to be blended into domestic transportation fuels and limited potential for expanded production by 2022. In the absence of advanced biofuels, most of the biofuel blended under the RFS to date has been conventional corn-starch ethanol, which achieves smaller greenhouse gas emission reductions compared with advanced biofuels. In addition, further reliance on ethanol to meet expanding RFS requirements is limited by incompatibility of ethanol blends above E10 with existing vehicle fleet and fueling infrastructure.

Limited Production of Advanced Biofuels Makes the RFS Unlikely to Meet Its Goals

It is unlikely that the goals of the RFS—to reduce greenhouse gas emissions and expand the nation’s renewable fuels sector—will be met as envisioned because there is limited production of advanced biofuels to be blended into domestic transportation fuels and limited potential for expanded production by 2022. As we report in [GAO-17-108](#), advanced biofuels are technologically well understood, but current production is far below the volume needed to meet the statutory targets for these fuels.¹⁸ For example, the cellulosic biofuel blended into transportation fuel in 2015 was less than 5 percent of the statutory target of 3 billion gallons. Given current production levels, most experts we interviewed told us that advanced biofuel production cannot achieve the statutory targets of 21 billion gallons by 2022.

The shortfall of advanced biofuels is the result of high production costs, despite years of federal and private research and development efforts. The RFS was designed to bring about reductions in greenhouse gas emissions by blending targeted volumes of advanced and, in particular, cellulosic, biofuels, because those fuels achieve greater greenhouse gas reductions than conventional corn-starch ethanol and petroleum-based fuel. However, because advanced biofuel production is not meeting the

¹⁷Department of Energy, *Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure*, (Washington, D.C.: Apr. 2015).

¹⁸[GAO-17-108](#).

RFS's targets, the RFS is limited in its ability to meet its greenhouse gas reduction goals as envisioned. According to several experts we interviewed, the investments and development required to make these fuels more cost-effective, even in the longer run, are unlikely in the current investment climate, in part because of the magnitude of investment and the expected long time frames required to make advanced biofuels cost-competitive with petroleum-based fuels.

The RFS Has Relied on Corn-Starch Ethanol, Which in Higher Blends Is Incompatible with Existing Infrastructure and Offers Comparatively Small Greenhouse Gas Reductions

In the absence of advanced biofuels, most of the biofuel blended under the RFS to date has been conventional corn-starch ethanol, which achieves smaller greenhouse gas emission reductions than advanced biofuels. As stated above, the use of corn-starch ethanol has been effectively capped at 15 billion gallons. As a result, further expansion of biofuels use will require increasing cellulosic biofuels and, according to report's companion report ([GAO-17-108](#)), the most likely cellulosic biofuel to be commercially produced in the near- to midterm will be cellulosic ethanol. However, reliance on adding more ethanol to the transportation fuel market to meet expanding RFS requirements is limited by the incompatibility of ethanol blends above E10 with the existing vehicle fleet and fueling infrastructure. Many experts and stakeholders refer to this infrastructure limitation as the "blend wall." If ethanol continues to be the primary biofuel produced to meet the RFS, these infrastructure limitations will have to be addressed.

Specifically with regard to the existing vehicle fleet, some experts told us that for most vehicles sold in the United States before 2015, the owner's manuals and warranties indicate that the vehicles should not use ethanol blends above 10 percent because of concerns about engine performance. Since 2011, EPA has issued waivers to the Clean Air Act allowing automobiles and light-duty trucks from model year 2001 and after to run on E15. However, many auto manufacturers contest this waiver, stating that automobile owners should follow their owner's manuals. The possibility that using higher blends of ethanol than E10 will cause vehicle warranties to be void may be reducing demand for these higher blends of ethanol. Flex fuel vehicles, which can run on ethanol blends up to E85, have entered the vehicle fleet but, as of 2016, were less than 10 percent of the total vehicle fleet, which may also limit the potential demand for

higher blends of ethanol.¹⁹ Further, several experts told us there is little demand from the public for E85 because the fuel offers lower gas mileage than E10 or E15 and prices of E85 do not reflect the need to refuel more frequently. Some experts told us that the demand for E85 has not been truly tested because the public (including owners of flex fuel vehicles) is largely undereducated about E85.

With regard to the fueling infrastructure, some experts stated that ethanol blends higher than E10 are largely incompatible with existing distribution and retail fueling tanks and pumps in the United States and that there are few incentives for fuel distributors and retailers to make the changes that would be needed to accommodate higher blends. Retail sale of these higher blends faces three key challenges:

- **Compatibility.** Ethanol blends higher than E10 may degrade or damage some materials used in existing underground storage tank systems and dispensing equipment such as pumps, potentially causing leaks.
- **Cost.** Because of concerns over compatibility, new storage and dispensing equipment may be needed to sell intermediate blends at retail outlets. The cost of installing a single-tank underground storage system compatible with intermediate blends is more than \$100,000. In addition, the cost of installing a single compatible fuel dispenser is over \$20,000.
- **Liability.** Since EPA has authorized E15 for use in model year 2001 and newer automobiles—but not for pre-2001 vehicles or nonroad engines—many fuel retailers are concerned about potential liability issues if consumers mistakenly use e15 in their older automobiles or nonroad engines.

Several experts raised concerns about the extent to which the RFS is achieving its targeted greenhouse gas emissions reductions, given that most biofuel blended under the RFS is corn-starch ethanol. More specifically, some experts were critical of the life-cycle analysis EPA used to determine the greenhouse gas emissions reductions for corn-starch ethanol. This criticism focuses on whether the model accurately accounts for all greenhouse gas emissions in the corn-starch ethanol production process. Some experts said that EPA's life-cycle analysis is flawed

¹⁹The U.S. Energy Information Administration reports that in 2016 there were approximately 19.6 million flexible fuel vehicles on the road designed to use any fuel blend up to E85. However, most of these vehicles are not using E85.

because it does not sufficiently include indirect land use change.²⁰ Further, as previously stated in this report, corn-starch ethanol plants that were in operation or under construction before December 19, 2007, were not subject to the requirement to reduce greenhouse gas emissions by at least 20 percent. According to an August 2016 EPA Inspector General report, grandfathered production that is not subject to any greenhouse gas reduction requirements was estimated to be at least 15 billion gallons, or over 80 percent of today's RFS blending volume.²¹ Moreover, some experts noted that under the RFS, because these facilities are grandfathered, they have no incentive to lower their greenhouse gas emissions. Some experts told us that the RFS creates a perverse incentive to import Brazilian sugarcane ethanol. Specifically, because sugarcane ethanol qualifies as an advanced biofuel, it is more profitable to import this fuel than to domestically produce advanced biofuels. According to these experts, the import of sugarcane ethanol, which occurs to meet RFS requirements, causes significant greenhouse gas emissions as a result of fuel burned during shipping.

²⁰Indirect land use change refers to the idea that diversion of an acre of traditional field cropland to grow a biofuels feedstock crop might result in the displaced traditional crop being planted on virgin soil. Such a transfer, if included in calculating the life-cycle greenhouse gas emissions of a particular biofuel, could result in an estimated net increase in emissions.

²¹Environmental Protection Agency, Office of Inspector General, *EPA Has Not Met Certain Statutory Requirements to Identify Environmental Impacts of Renewable Fuel Standard*, 16-P-0275 (Washington, D.C.: Aug. 18, 2016).

Experts Suggested Multiple Federal Actions That Could Incrementally Encourage Investment in Advanced Biofuels and Increase Compatibility of Infrastructure with Higher Ethanol Blends

While advanced biofuels are not likely to be produced in sufficient quantities to meet the statutory targets, experts identified actions that they suggested could incrementally improve investment in advanced biofuels and may lead to greater volumes of these fuels being produced and used in the longer term. In addition, experts identified actions to increase compatibility of infrastructure with higher ethanol blends.

Experts Identified Actions That Could Incrementally Encourage Investment in Advanced Biofuels

Experts identified actions that they suggested could incrementally improve the investment climate for advanced biofuels and possibly encourage the large investments and rapid development required to make these fuels more cost-effective.

The reset provision provides that, if EPA waives any of the biofuel category requirements

- by at least 20 percent for 2 consecutive years or
- by at least 50 percent for a single year

EPA shall modify the statutory volume targets for all subsequent years. EPA—in coordination with the DOE and USDA—must determine the applicable volumes based on a review of program implementation thus far and analysis of certain factors (e.g., the impact of the production and use of biofuels on the environment).

Source: 42 U.S.C. § 7545(o)(7)(F). | GAO-17-94

Addressing uncertainty about the future of the RFS: Many experts told us that uncertainty about the future of the RFS is limiting investment in advanced biofuels. In particular, some experts stated that the possibility of a repeal of the RFS has caused potential investors to question whether the RFS will continue to exist until 2022 and beyond. According to these experts, however, in the current political climate little can be done to address the threat of a repeal of the RFS. EPA may be able to improve the investment climate for advanced biofuels by clarifying its plans for managing the program in upcoming years. Specifically, statutory volume targets have been set through 2022. After that, EPA will be responsible for setting these volumes. One expert said that if EPA provided more insight into its plans for setting post-2022 volume targets, it could reduce some of this investment uncertainty. Further, the annual requirement that EPA finalized in 2015 triggered what is commonly referred to as the “reset provision” of the RFS for the advanced biofuel and cellulosic biofuel categories. The reset provision requires EPA to modify the statutory volume targets for future years if certain conditions are met (see sidebar). Although the statute provides factors for EPA to consider when modifying these volumes, EPA has not specified how it will approach setting

volumes under this reset provision. As a result, several experts thought that uncertainty about the volumes of advanced and cellulosic biofuels affected by the reset may be limiting investments in these fuels. Some experts thought that EPA should clarify how it will implement the reset to reduce negative impacts on investments in advanced biofuels. EPA officials told us that recent annual volume requirements make EPA's intent clear in the near term.

Providing more consistent subsidies to advanced biofuel producers.

Some experts stated that the Second Generation Biofuel Producer Tax Credit—an incentive to accelerate commercialization of fuels in the advanced and cellulosic biofuels categories—has expired and been reinstated (sometimes retroactively) about every 2 years, contributing to uncertainty among cellulosic fuel producers and investors. These experts told us that investment in cellulosic biofuels could be encouraged, in part, by maintaining the Second Generation Biofuel Producer Tax Credit consistently, rather than allowing it to periodically lapse and be reinstated. Specifically, one expert suggested three major changes to the advanced biofuel tax credits:

- Extending the tax credit long term (e.g., 10 years) to provide investors sufficient investment return certainty for the large investment of building a biofuel plant until a cumulative level of second generation biofuel has been produced and costs have fallen.
- Making the producer tax credit refundable to guarantee that biofuel producers receive the subsidy in the early years when they are carrying losses.²²
- Coupling the producer tax credit with an investment tax credit to decrease capital costs and improve the financial incentives for building cellulosic biofuel plants.

Expanding the types of fuel that qualify for the RFS. The current RFS framework specifies that qualifying biofuels must be derived from biomass-based feedstocks. According to some experts, this excludes some types of low carbon fuels from qualifying under the RFS. One example provided by experts is a process that uses microbes that capture carbon from industrial sources—such as the waste gas emitted from steel production—to produce a biofuel with lower greenhouse gas emissions

²²According to this expert, currently the Second Generation Biofuel Producer Tax Credit is not refundable or reimbursable, so it does not provide value in years when the producer has zero or negative tax liability.

than petroleum-based fuels. However, because this fuel is not derived from renewable biomass, it does not qualify for any RFS category. According to these experts, expanding the RFS to include fuel types such as this would better incentivize investment in innovative technologies.²³

Reducing RIN fraud and price volatility. Some experts said that a lack of transparency in the RIN trading market has led to an increased risk of fraud and increased volatility of RIN prices. This has caused uncertainty among potential investors.

- *RIN fraud.* From the beginning of the RFS program, there have been concerns surrounding RIN generation and the RIN market. Because RINs are essentially numbers in a computerized account, there have been errors and opportunities for fraud, such as double counting RINs or generating RINs for biofuels that do not exist.²⁴ To address concerns over these issues, EPA established an in-house trading system called the EPA Moderated Transaction System (EMTS). However, EPA has maintained that verifying the authenticity of RINs is the duty of obligated parties. Under this “buyer beware” system, those purchasing or receiving RINs must verify the RINs’ validity on their own, and they are responsible for any fraudulent RINs they sell or submit to EPA for compliance. However, fraud cases in the last few years have raised questions about whether this “buyer beware” system is sufficient to deter fraud. Furthermore, obligated parties that inadvertently purchase fraudulent RINs lose the money spent to purchase them, must purchase additional RINs to meet their obligations, and face additional costs. This has a disproportionate effect on small refiners: whereas large obligated parties—in particular, vertically integrated refiners that typically own blending operations—can generate RINs by blending fuel, small refiners do not blend fuel and must purchase their RINs on the market to meet their obligations and are therefore more likely to be adversely affected by fraudulent RINs.

²³In October 2016, EPA proposed several measures that it says will boost production and use of biofuels under the RFS. In addition to approving some new advanced biofuel pathways that were under review, EPA proposed an updated regulatory structure that would allow biofuel producers to partially process renewable feedstocks at one facility and further process them into biofuels at another facility under an existing fuel pathway. EPA says this would improve production efficiency, particularly for advanced and cellulosic biofuels.

²⁴Congressional Research Service, *Analysis of Renewable Identification Numbers (RINs) in the Renewable Fuel Standard (RFS)*, R42824 (Washington, D.C.: July 22, 2013).

-
- *RIN price volatility.* Further, according to some experts, price volatility in RIN markets adversely affects small refiners in particular and leads to uncertainty among investors. While most RINs are bought and sold through private contracts registered with the EMTS, there are also spot markets for RINs. Some experts told us that price volatility may be due, in part, to nonobligated parties speculating in these spot markets. According to one expert, the current system leaves small refiners disproportionately exposed to RIN price fluctuations because they must purchase their RINs on the market, as previously discussed. Such price fluctuations introduce uncertainty for small refiners about the costs of compliance with the RFS.

These concerns about RIN fraud and price volatility have led to uncertainty among potential investors. Some experts told us that EPA should make RIN market trading more open and transparent like other commodity markets, which could reduce the potential for fraudulent RIN activities and reduce RIN price volatility. EPA officials told us that EPA has recently begun to publish aggregated data on RIN transactions and biofuel volume production on its website in an effort to make the RIN market more transparent. However, it is too early to know how effective this will be in addressing fraud and price volatility.

Experts Identified Actions to Increase Compatibility of Infrastructure with Higher Ethanol Blends

Several experts suggested that expanding grants to encourage infrastructure improvements, such as USDA's Biofuel Infrastructure Partnership, could increase both the availability and competitiveness of higher blends at retail stations nationwide. Currently through this partnership, USDA is investing \$100 million to install nearly 5,000 pumps offering high ethanol blends in 21 states. Some experts also said that blender pumps are not being installed with the density required to test demand. One expert suggested that, instead of installing blender pumps at all the stations of a certain brand in a region, blender pumps should be installed at all the stations at a specific road intersection. That way, these stations would be forced to compete with each other, which this expert told us would result in more competitive prices at the pump and increased incentives to make improvements to fueling infrastructure. Further, one expert suggested that dealers educate consumers about flex fuel vehicle features when the vehicles are delivered, as dealers previously did when on-board diagnostic, check engine light, and Bluetooth synchronizing features were introduced. Under these conditions, demand for higher ethanol blends—and E85, in particular—could be better tested. In response to these concerns and suggestions, a USDA official told us that, while it is not mandatory that installations meet a required geographic

density, many of the blender pumps could be installed on highway corridors, which could encourage competition. This official also told us that, in addition to expanding infrastructure for higher ethanol blends, the Biofuel Infrastructure Partnership will be able to provide data associated with testing demand for E85, including pricing, consumer education, and next steps for the program. In addition, in October 2016, EPA proposed an update to fuel regulations to allow expanded availability of high ethanol fuel blends for use in flex fuel vehicles. EPA is proposing revisions to its gasoline regulations to make it clear that E16 through E83 fuel blends are not gasoline, and hence not fully subject to gasoline quality standards. EPA believes these revisions will increase demand for higher ethanol blends.

Some experts said that blenders should be the obligated parties, instead of importers and refiners, because that would lead to more rapid investments in infrastructure for higher ethanol blends. According to some experts, when EPA designed the RFS, it placed the obligation for compliance on the relatively small number of refiners and importers rather than on the relatively large number of downstream blenders in order to minimize the number of obligated parties to be regulated and make the program easier to administer. However, these experts told us that obligating refiners and importers has not worked to incentivize investors to expand infrastructure for higher ethanol blends. Specifically, increasing consumer demand for biofuels—and the corresponding incentives to invest in biofuel infrastructure—requires the value of the RIN be “passed through” to consumers. More specifically, because the RIN that accompanies the gallon of biofuel has value for demonstrating compliance with the RFS or when sold in the market, it can be used to offset the higher cost of the biofuel and make it more competitive with petroleum-based fuels. By making biofuels more competitive, retailers are incentivized to build the infrastructure required to sell more of these fuels (i.e., higher ethanol blends). According to some experts and industry stakeholders, this pass-through has not been occurring as envisioned with refiners and importers as the obligated parties. One expert stated that, because blenders are either retailers or sell to retailers, blenders would be better situated to pass RIN savings along to consumers. This in turn might encourage demand for higher ethanol blends and incentivize infrastructure expansion. EPA officials told us they have received several petitions requesting that they consider changing the point of obligation and are evaluating those petitions.

Experts Suggested Policy Alternatives That Could More Efficiently Reduce Greenhouse Gas Emissions

Several experts stated that the RFS is not the most efficient way to achieve the program's goal of reducing greenhouse gas emissions, and they suggested policy alternatives—in particular, a carbon tax and a low carbon fuel standard (LCFS). Some experts stated that the design of the RFS may undermine its ability to achieve the greatest greenhouse gas emissions reductions. Specifically, some experts said that the RFS does not incentivize the production of advanced biofuels, which achieve the greatest greenhouse gas emission reductions. For example, a cellulosic fuel that reduces greenhouse gas emissions by 80 percent receives no more credit under the RFS than one that reduces greenhouse gas emissions by 60 percent, the baseline for the cellulosic category. As a result, fuels that may be slightly more costly to produce but achieve far greater greenhouse gas reductions may not be developed and brought to the market. Further, one expert stated that the RFS design creates a market rebound effect. That is, increasing the supply of biofuels tends to lower energy prices, which encourages additional fuel consumption that may actually result in increased greenhouse gas emissions.

Several experts suggested that a carbon tax or an LCFS would be more efficient at reducing greenhouse gas emissions. Specifically, some experts said that, whereas the RFS creates disincentives for the production of cellulosic fuels that achieve the greatest greenhouse gas emission reductions, a carbon tax or LCFS would incentivize the technologies that achieve the greatest reductions in greenhouse gas emissions at the lowest cost. According to one expert, a carbon tax would eliminate the need for annual volume requirements and the accompanying program management and oversight. Under a carbon tax, each fossil fuel would be taxed in proportion to the amount of greenhouse gas (carbon dioxide) released in its combustion. In addition, one expert stated that a carbon tax is preferable to the RFS because it allows market effects to increase the price of emission-causing activities, which decreases demand for those activities. As a result, it could sustain consumers' interest in fuel-saving vehicles and would result in a wide range of fuel-saving responses from all consumers (rather than just those purchasing a new vehicle). However, some experts also noted that a carbon tax would force further electrification for light-duty transportation because the electric power sector is the cheapest sector from which to obtain greenhouse gas reductions. According to one expert, this electrification of the light-duty fleet might further limit research and development of biofuels, in effect undermining the RFS goal to expand that sector.

In light of this, several experts said that an LCFS would be more flexible and efficient than the RFS at developing biofuels that achieve the greatest greenhouse gas reductions.²⁵ Specifically, an LCFS compares cost with greenhouse gas intensity (by accounting for carbon on a cost per unit of carbon intensity), thereby supporting incremental carbon reductions. An LCFS can be implemented in one of two ways. The first involves switching to direct fuel substitutes (e.g., drop-in fuels) or blending biofuels with lower greenhouse gas emissions directly into gasoline and diesel fuel. The second involves switching from petroleum-based fuels to other alternatives, such as natural gas, hydrogen, or electricity, because a low carbon fuel standard would allow a wider array of fuel pathways than the RFS. Under the first scenario, an LCFS would promote biofuel usage, rather than incentivizing electrification of the light-duty vehicle fleet. As a result, according to some experts, an LCFS is preferable to a carbon tax because it more efficiently reduces greenhouse gas emissions and promotes the expansion of the biofuel sector. However, other experts we spoke with critiqued an LCFS as being uneconomical. Specifically, one expert stated that, while an LCFS such as the one in California could force technology and create greenhouse gas reductions in the fuel market, the costs of implementing an LCFS are much higher than its benefits.

²⁵For example, the California Low Carbon Fuel Standard requires a 10-percent reduction in the carbon intensity of fuels in the State of California by 2020. It requires fuel suppliers to reduce the expected lifecycle greenhouse gas emissions from motor fuels on the basis of the fuels' energy content. In this way, the greenhouse gas intensity of transportation fuels decreases, regardless of the growth in transportation or fuel demand.

Agency Comments and our Evaluation

We provided a draft of this product to EPA for comment. In its written comments, reproduced in appendix III, EPA generally concurred. EPA also provided technical comments, which we incorporated as appropriate.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time we will send copies to the appropriate congressional committees and to the Administrator of the EPA. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff members have any questions about this report, please contact me at (202) 512-3841 or ruscof@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Sincerely yours,



Frank Rusco
Director, Natural Resources and Environment

Appendix I: Scope and Methodology

The objectives of this report were to provide information on (1) whether the Renewable Fuel Standard (RFS) is expected to meet its goals, (2) expert views on any federal actions that could improve the RFS framework, and (3) policy alternatives experts suggested to better meet the goals of the RFS in the future.

To address our objectives, we contracted with the National Academy of Sciences to provide us with a list of experts on issues related to the RFS, including the current structure of the RFS; blending, distribution, and marketing infrastructure of biofuels; automobile manufacture; and petroleum consumption and prices. The National Academy of Sciences identified 25 experts, including experts from academia and policy think tanks and practitioners with relevant experience.¹ Areas of expertise included policy analysis of the RFS, first-hand knowledge of the production and distribution of biofuels and flex fuel vehicles, and the economic and environmental ramifications of the RFS. We conducted semistructured interviews and performed a content analysis of the 24 experts' responses to our questions. For reporting purposes, we categorized expert responses as follows:

- “nearly all” experts represents 21 to 23 experts,
- “most” experts represents 16 to 20 experts,
- “many” experts represents 11 to 15 experts,
- “several” experts represents 6 to 10 experts, and
- “some” experts represents 2 to 5 experts.

See appendix II of this report for a list of experts whose names were provided by the National Academy of Sciences.

We also reviewed public comments from stakeholders, relevant legislation, and agency documents pertaining to annual volume requirements (e.g., the Environmental Protection Agency's (EPA) response to public comments) and conducted a literature search for research related to the RFS. In addition, we interviewed officials at EPA, the Department of Energy (DOE), and the Department of Agriculture (USDA). We also interviewed Congressional Research Service officials who have conducted extensive work on the RFS. To provide expert views

¹We could not reach one of the experts provided by the National Academy of Sciences. After determining that this expert's absence would not affect the balance of the group, we removed him from our expert list.

on actions needed to address these challenges and meet the goals of the RFS in the future, we used our content analysis of the experts' responses, which identified possible actions within the current RFS structure, changes to the RFS structure, and through policy alternatives to the RFS. Finally, this report drew from a companion report, [GAO-17-108](#), that examined federal research and development in advanced biofuels and related issues.²

We conducted this performance audit from June 2015 to November 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

²[GAO-17-108](#).

Appendix II: List of Experts' Names Provided by the National Academy of Sciences

Table 1: List of Experts' Names Provided by the National Academy of Sciences

Name	Affiliation
Bruce Babcock	Iowa State University
David Babson	Union of Concerned Scientists
John Caupert	National Corn to Ethanol Research Center
Joseph M. Colucci	Automotive Fuels Consulting, Inc.; General Motors Research and Development Center (retired)
John DeCicco	University of Michigan Energy Institute
Harry de Gorter	Cornell University
Matthew Forman	Fiat Chrysler
Barry Frazier	Center Oil Company
Jeff Gallic	Thorntons Inc.
Jason Hill	Institute on the Environment, University of Minnesota
Scott H. Irwin	University of Illinois
Madhu Khanna	Institute for Sustainability, Energy and Environment, University of Illinois, Urbana-Champaign
Ron Minsk	Center on Global Energy Policy
John Miranowski	Iowa State University
Steffen Mueller	Energy Resources Center, University of Illinois at Chicago
Sebastien Pouliot	Iowa State University
Jonathan Rubin	University of Maine
Benjamin Salisbury	FBR Capital Markets
Dan Sperling	University of California, Davis
James H. Stock	Kennedy School, Harvard University
Stephanie Searle	International Council on Clean Transportation
Jim Sweeney	Stanford University
Wallace E. "Wally" Tyner	Purdue University
Wallace "Wally" R. Wade	Ford Motor Company (retired)

Source: National Academy of Sciences. | GAO-17-94

Appendix III: Comments from the Environmental Protection Agency



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 16 2016

OFFICE OF
AIR AND RADIATION

Mr. Frank Rusco
Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Rusco:

Thank you for the opportunity to review and comment on the U.S. General Accountability Office's draft report, "Renewable Fuel Standard: Program Unlikely to Meet Its Targets for Reducing Greenhouse Gas Emissions" (GAO-17-94). As stated in the report, GAO's objective was to provide information about the Renewable Fuel Standard (RFS) program, challenges to its implementation, and possible solutions or policy alternatives. The report aims to provide information on "(1) whether the RFS is expected to meet its goals, (2) expert views on any federal actions, if any, that could improve the RFS framework, and (3) policy alternatives experts suggested to better meet the goals of the RFS in the future." The report does not contain any recommendations.

I am responding on behalf of the U.S. Environmental Protection Agency, as the primary office that participated in this review, and the office charged with implementing the RFS program, is the EPA's Office of Air and Radiation. The EPA generally agrees with the report's overarching conclusion that the RFS program is likely to fall short of its Congressional goals with respect to greenhouse gas (GHG) emissions, due in particular to limited production of cellulosic biofuels and limited potential for expanded production by 2022. Below I provide comments on and responses to the draft report, along with some points of clarification. We separately are providing specific edits to the draft report for your consideration.

As explained in the report, in assembling this report the GAO worked with the National Academies of Science to identify experts on issues related to the RFS, interviewed those experts, and then analyzed their responses. The report also draws on published studies and from a companion report, GAO-17-108, that examines the federal research and development (R&D) in to advanced biofuels as well as the ability of the program to meet the advanced volume standards.

The draft report's background section provides an overview of the RFS program and the EPA's responsibilities. The section briefly discusses the EPA's use of the provisions in the Clean Air Act allowing the Administrator to lower (waive) the volume targets from the statutory levels. While we understand the importance of brevity for purposes of the GAO report, we note that the rulemaking actions that established required volumes under the program for 2014-2016 discuss the technical basis and legal authority for lowering the volumes below statutory levels in comprehensive detail.

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The relevant rulemaking documents provide extensive information and analysis on current and anticipated biofuel production, the feasibility of hitting the statute's volume targets, and our interpretation of the Act's waiver authorities.¹ We also note that the EPA's recent annual volume rules, while finalizing (and for 2017, proposing) volume requirements lower than the statutory targets, establish volume standards that steadily increase biofuel volumes – including advanced biofuels – year over year.

A primary objective of the RFS program is to achieve GHG reductions in the transportation sector by requiring the increasing use of advanced biofuels with lower lifecycle GHG emissions profiles relative to fossil-based transportation fuels. The EPA agrees with the draft report's conclusion that a primary reason that the RFS program is unlikely to meet this Congressional objective is limited production of cellulosic biofuels and limited potential for expanded production of these fuels by 2022. Cellulosic biofuels are required to have 60 percent or greater greenhouse gas emissions benefits on a lifecycle basis than the petroleum based fuels they replace. As we discuss in our annual rules establishing required volumes under the RFS program, the cellulosic biofuel industry continues to transition from R&D and pilot scale operations to commercial scale facilities, but overall production volumes still remain low relative to those Congress envisioned. While industry and other stakeholders continue to address the technical and economic challenges associated with increasing cellulosic biofuel production (e.g., its high cost of production relative to other biofuels and petroleum-based fuels), the slower-than-anticipated pace of progress means that Congress's original goals for the program will not be met on the statutory timeline.

We note, however, that while cellulosic biofuel production still remains in its early stages, other advanced biofuels such as biodiesel and renewable diesel are commercially mature today and are contributing towards meeting the statute's objectives (biomass-based diesel is required to meet a 50 percent GHG lifecycle reduction relative to petroleum-based diesel).

The draft report accurately states that most of the biofuel used in the U.S. has been conventional ethanol produced from corn starch, and recognizes some of the market limitations associated with increasing blends of ethanol (whether conventional or cellulosic) beyond E10. The EPA has examined these limitations in depth in our recent RFS annual volume rulemakings. While we recognize such constraints exist, we also believe that over time, as a result of both forward-pushing RFS volume standards and complementary efforts by industry and other stakeholders, more ethanol is likely to be blended and used in higher ethanol-content fuels, including E15 and E85.

The draft report lists actions identified by experts that could potentially encourage investment in advanced biofuels. Some of these actions fall outside of the EPA's purview, such as providing a more consistent subsidy to advanced biofuel producers through changes in tax policy. The EPA has already taken action in some of the other areas identified in the draft report. For example, to combat fraud in the program, the EPA has developed and implemented a regulatory Quality Assurance Program to help verify the validity of RINs (the compliance credits under the RFS program). The QAP program provides a structured process for independent third parties to audit the production of renewable fuel and the generation of RINs. And as the draft report acknowledges, The EPA has also taken steps to increase the amount of information and data related to program implementation on our RFS website, which should help improve overall program transparency.

¹ See Renewable Fuel Standard Program: Standards for 2014, 2015, and 2016 and Biomass-based Diesel Volume for 2017; Proposed Rule, 80 Fed. Reg. 33100; and Final Rule, 80 Fed. Reg. 77420 (2015).

The report cites “some” experts who argue that blenders should be made the obligated parties under the program, rather than importers and refiners, “because that would lead to more rapid investments in infrastructure for higher ethanol blends.” Over the past year, the EPA has received several petitions from RFS stakeholders asking us to change the point of obligation under the program. On November 10, 2016, we issued a proposed denial of these petitions that examines this issue in depth and provides an opportunity for the public to provide comment to the agency.² In summary, based on information we have to date, we are not persuaded by arguments from petitioners that moving the point of obligation would lead to accelerated investments in infrastructure. In fact, we believe that the uncertainty that would be introduced into the program and the market were we to move forward with such a change could potentially have the opposite effect, and delay further investment in the sector. We encourage all stakeholders to review our assessment of this issue and provide comment and data to the agency.

GAO’s draft report concludes with a discussion of policy alternatives that could potentially reduce GHG emissions more efficiently than the RFS program. The EPA appreciates these ideas, and we continuously look for ways to improve our performance in implementing the program. We are particularly interested in ways that we can better achieve the goal of reducing GHG emissions through the development of low GHG-emitting advanced biofuels. The EPA has taken multiple steps to that end in recent years. Most importantly, we continue to establish annual volume standards that require increasing volumes of advanced biofuels over time.³ We have also taken other regulatory steps, including issuing the *Regulatory Enhancement and Growth Support* proposed rule, a collection of fuel regulations intended to support market growth of advanced and other biofuels in the U.S.⁴ That proposal, for example, would establish an updated regulatory structure that would allow biofuel producers to partially process renewable feedstocks at one facility and further process them into renewable fuels at another facility under existing pathways. This would increase the economics and efficiency for the production of biofuels, particularly advanced and cellulosic fuels that have lower GHG footprints. Separately, the EPA has made strides in streamlining some of our RFS internal review processes. For example, we have improved the quality, transparency, and efficiency of our petition review process for new biofuel pathways that can count under the RFS program. These improvements to our pathways review process are already making a difference. Since putting our streamlining initiative into place, we have approved several new pathways for second-generation biofuels.

Thank you again for the opportunity to review and respond to the draft report. If you have any questions or require further information, please contact Julia Burch at (202) 564-0961.

Sincerely,



Janet G. McCabe
Acting Assistant Administrator

Enclosure: EPA edits to draft GAO report

² <https://www.epa.gov/renewable-fuel-standard-program/response-petitions-reconsideration-rfs2-rule-change-point-obligation>

³ <https://www.epa.gov/renewable-fuel-standard-program/proposed-renewable-fuel-standards-2017-and-biomass-based-diesel>

⁴ <https://www.epa.gov/renewable-fuel-standard-program/proposed-renewables-enhancement-and-growth-support-regs-rule>

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Frank Rusco, (202) 512-3841 or ruscof@gao.gov.

Staff Acknowledgments

In addition to the individual named above, Karla Springer (Assistant Director), Jessica Artis, and Jarrod West made key contributions to this report. Luqman Abdullah, Richard Burkard, Cindy Gilbert, Robert Keane, Scott McClinton, Cynthia Norris, and Dan Royer also made important contributions.

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