

# EPA Proposes New Regulations for the National Renewable Fuel Standard Program for 2010 and Beyond

## Introduction

The U.S. Environmental Protection Agency is proposing revisions to the National Renewable Fuel Standard program (commonly known as the RFS program). Today's proposed rule intends to address changes to the Renewable Fuel Standard program as required by the Energy Independence and Security Act of 2007 (EISA). The revised statutory requirements establish new specific volume standards for cellulosic biofuel, biomass-based diesel, advanced biofuel, and total renewable fuel that must be used in transportation fuel each year. The revised statutory requirements also include new definitions and criteria for both renewable fuels and the feedstocks used to produce them, including new greenhouse gas emission (GHG) thresholds for renewable fuels. The regulatory requirements for RFS will apply to domestic and foreign producers and importers of renewable fuel.

## General Background

The U.S. Environmental Protection Agency (EPA) is proposing to modify the national RFS program. The current Renewable Fuel Standard program (RFS1) was established under the Energy Policy Act of 2005 (EPAct) which amended the Clean Air Act by establishing the first national renewable fuel standard. The U.S. Congress gave EPA the responsibility to coordinate with the U.S. Department of Energy, the U.S. Department of Agriculture, and stakeholders to design and implement this new program. With the passage of EISA, Congress made several important revisions to these renewable fuel standards that require EPA to promulgate new regulations to implement these changes.

## New Renewable Volume Standards

This rule proposes to establish the revised annual renewable fuel standard (RFS2) and to make the necessary program modifications as set forth in EISA. Of these modifications, several are significantly notable. First, the volume standard under

RFS2 was increased beginning in 2008 from 5.4 billion gallons (Bgal) to 9.0 Bgal. Thereafter, the required volume continues to increase under RFS2, eventually reaching 36 Bgal by 2022. The following chart shows all the volume requirements from EISA.

**Renewable Fuel Volume Requirements for RFS2 (billion gallons)**

Year	Renewable Fuel Volume Requirements for RFS2 (billion gallons)			Total renewable fuel requirement
	Cellulosic biofuel requirement	Biomass-based diesel requirement	Advanced biofuel requirement	
2008	n/a	n/a	n/a	9.0
2009	n/a	0.5	0.6	11.1
2010	0.1	0.65	0.95	12.95
2011	0.25	0.80	1.35	13.95
2012	0.5	1.0	2.0	15.2
2013	1.0	a	2.75	16.55
2014	1.75	a	3.75	18.15
2015	3.0	a	5.5	20.5
2016	4.25	a	7.25	22.25
2017	5.5	a	9.0	24.0
2018	7.0	a	11.0	26.0
2019	8.5	a	13.0	28.0
2020	10.5	a	15.0	30.0
2021	13.5	a	18.0	33.0
2022	16.0	a	21.0	36.0
2023+	b	b	b	b

<sup>a</sup> To be determined by EPA through a future rulemaking, but no less than 1.0 billion gallons.

<sup>b</sup> To be determined by EPA through a future rulemaking.

## EISA Expands Coverage to Include Diesel and Nonroad Fuels

EISA expanded the program application beyond gasoline to generally cover all transportation fuel. This now includes gasoline and diesel fuel intended for use in highway vehicles and engines, and nonroad, locomotive and marine engines. As in RFS1, EPA is proposing that these provisions apply to refiners, blenders, and importers of transportation fuel (with limited flexibilities for small refiners), and that their percentage standards apply to the total amount of gasoline and diesel they produce for such use. We also propose to use the current definition of motor vehicle, nonroad, locomotive, and marine diesel fuel (MVNRLM) to determine the obligated volumes of non-gasoline transportation fuel for this rule.

## Greenhouse Gas Reduction Thresholds

EISA established new renewable fuel categories and eligibility requirements, including setting the first ever mandatory GHG reduction thresholds for the various categories of fuels. For each renewable fuel pathway, GHG emissions are evaluated over the full lifecycle, including production and transport of the feedstock; land use change; production, distribution, and blending of the renewable fuel; and end use of the renewable fuel. The GHG emissions are then compared to the lifecycle emissions of 2005 petroleum baseline fuels (base year established as 2005 by EISA) displaced by the renewable fuel, such as gasoline or diesel. The lifecycle GHG emissions performance reduction thresholds as established by EISA range from 20 to 60 percent reduction depending on the renewable fuel category.

### Lifecycle GHG Thresholds Specified in EISA

(percent reduction from 2005 baseline)

Renewable fuel <sup>a</sup>	20%
Advanced biofuel	*50%
Biomass-based diesel	50%
Cellulosic biofuel	60%

<sup>a</sup> The 20% criterion generally applies to renewable fuel from new facilities that commenced construction after December 19, 2007.

\*EPA is proposing to exercise the 10% adjustment allowance provided for in EISA for the advanced biofuels threshold to as low as 40%

In order for renewable fuels to qualify, they must meet or exceed these minimum GHG reduction thresholds. For general information on lifecycle GHG emissions methodology and results for renewable fuel pathways, please see the Lifecycle GHG Analysis Fact Sheet.

## Feedstock Production Limitations

The revised statutory requirements also include new definitions and criteria for both renewable fuels and the feedstocks used to produce them. These definitions affect feedstock use for production of compliant renewable fuels and certain restrictions on the type of land that can be used to grow those feedstocks.

## Treatment of Required Volumes in 2009

Under the RFS1 regulations the annual percentage standards that are applicable to obligated parties are determined by a formula set forth in the regulations. The formula uses gasoline volume projections from the Energy Information Administration (EIA) and the required volume of renewable fuel provided in Clean Air Act section 211(o)(2)(B). Since EISA modified the required volumes in this section of the Clean Air Act, it is the new statutory volumes that must be used under the RFS1 regulations in generating the standards for 2009. Therefore, in a November 21, 2008 Federal Register notice<sup>1</sup>, we used the new total renewable fuel volume of

<sup>1</sup>73 FR 70643

11.1 billion gallons as the basis for the 2009 standard, and not the 6.1 billion gallons that was required by the Energy Policy Act of 2005. The RFS standard in 2009 will continue to be applicable to producers or importers of gasoline and only for the volume of gasoline that they produce or import.

While this approach applies the total renewable fuel volume standard of 11.1 billion gallons required by EISA for 2009, the RFS1 regulatory structure does not provide a mechanism for implementing the 0.5 billion gallon requirement for biomass-based diesel. Therefore, we are proposing to address this issue by increasing the 2010 biomass-based diesel requirement by 0.5 billion gallons and allowing 2009 biodiesel and renewable diesel RINs to be used to meet this combined 2009/2010 requirement. We believe this would provide similar incentive for biomass-based diesel use in 2009 as would have occurred had we been able to implement this standard for 2009.

## Proposed Standards for 2010

Once the RFS2 program is implemented, we expect to conduct a notice-and-comment rulemaking process each year in order to determine the appropriate standards applicable in the following year. We will thus need to issue an NPRM in the spring and a final rule by November 30 of each year as required by statute. However, we are proposing the 2010 standards in today's notice. We will consider comments received during the comment period associated with today's NPRM and other information that has become available following the analyses in the NPRM, and we will issue a final rule by November 30, 2009 setting the applicable standards for 2010.

Based on information from the industry, we believe that there are sufficient plans underway to build plants capable of producing 0.1 billion gallons of cellulosic biofuel in 2010, the minimum volume of cellulosic biofuel required by EISA for 2010. However, we recognize that cellulosic biofuel is at the very earliest stages of commercialization and current economic concerns could have significant impacts on these near term plans. Therefore, while based on industry plans available to EPA, we are not proposing that any portion of the cellulosic biofuel requirement for 2010 be waived, we are seeking additional and updated information that would be available prior to November 30, 2009 which could result in a change in this conclusion. Similarly, we are not aware of the need to waive any other volume mandates for 2010. Therefore, we are proposing that the renewable fuel volume requirements for RFS2 shown in the table above for all renewable fuel categories be used as the basis for the applicable standards for 2010. The proposed standards are shown below, each representing the fraction of a refiner's or importer's gasoline and diesel volume which must be renewable fuel.

Proposed Standards for 2010

Cellulosic biofuel	0.06%
Biomass-based diesel	0.71%
Advanced biofuel	0.59%
Renewable fuel	8.01%

The proposed 2010 standards shown above were based on currently available projections of 2010 gasoline and diesel volumes. The final standards would be calculated on the basis of gasoline and diesel volume projections from the Energy Information Administration's (EIA) Short-Term Energy Outlook and published by November 30, 2009.

## **Program Design and Proposed Implementation Approach**

Today's notice proposes to revise the RFS program regulations to implement the EISA provisions. In designing this proposed RFS2 program, the Agency is building on the same programmatic structure created to implement the current renewable fuel program. We propose to continue to use the Renewable Identification Number (RIN) system currently in place to track renewable fuels and determine compliance with modifications designed to implement the EISA provisions. At the same time, we are also proposing and seeking comment on several provisions aimed at enhancing the RIN system based on our experience to date implementing RFS1.

We are proposing that the changes would apply starting January 1, 2010. The current RFS1 regulations would continue to apply until EPA amends them to implement EISA, and any delay in issuance of the RFS2 regulations means that parties would continue to be subject to the RFS1 regulations until the RFS2 regulations are in effect. Therefore, regulated parties will continue to be subject to the existing regulations at least through December 31, 2009, or later if the effective date of the RFS2 program were later than January 1, 2010.

## **Overview of Impacts of the Rule**

Analyses were conducted to determine the economic impacts of the rule, impacts on energy security, fuel costs, petroleum consumption, greenhouse gases, the agricultural sector and emissions affecting air and water quality.

The revised renewable fuel standards are expected to reduce dependence on foreign sources of crude oil, increase domestic sources of energy, and diversify our energy portfolio to help in moving beyond a petroleum-based economy, while at the same time providing important reductions in greenhouse gas emissions such as carbon dioxide that affect climate change. The increased use of renewable fuels such as ethanol, biodiesel and other renewable fuels is also expected to have the added benefit of providing an expanded market for agricultural products such as corn and soybeans and open new markets for the development of cellulosic feedstock industries and conversion technologies. As we work to implement the requirements of EISA, we will continue to assess these impacts. While the volumes of renewable fuel were specified by statute and would thus not be based on or revised by these impact assessments, such assessments nevertheless play a critical role in the wider public policy considerations of renewable fuels.

The proposed rule also includes substantial analysis for when we anticipate ethanol production to exceed the volume that can practically be blended into gasoline nationwide at 10 volume percent level (E10), known as the "blend wall." The 10% per gallon by volume limit in gasoline is based on a Clean Air Act waiver granted in 1978. The analysis includes a discussion of

distribution issues for E10, E85, and potential mid-level blends such as E15, and how distribution issues may affect when the blend wall is reached.

In a separate process, the Agency is handling a Clean Air Act waiver request to expand the allowable ethanol content of gasoline up to E15. The Agency is evaluating whether vehicles and engines will meet emission and durability standards over their useful lives on E15.

## Greenhouse Gas Emissions

For the first time in a regulatory program, lifecycle analysis of GHG emissions is being utilized to establish those fuels that qualify for the different renewable fuel standards. Based on our lifecycle analysis, we believe that the expanded use of renewable fuels would provide significant reductions in GHG emissions over time, such as carbon dioxide. To determine the GHG impacts of the RFS2 program, EPA analyses considered the full useful life assessment of the production of biofuels compared to the petroleum-based fuels they would replace. Based on a combined use of various models, we have analyzed the lifecycle GHG emissions for a number of pathways for producing the increased volumes of renewable fuels that are mandated by EISA. The incremental volumes of each biofuel type were then evaluated to determine their average impact on GHG emissions compared to the 2005 baseline petroleum fuel they would be displacing.

We estimate the greater volumes of biofuel mandated by RFS2 will reduce GHG emissions from transportation by a total of 6.8 billion tons CO<sub>2</sub> equivalent when measured over a 100 year timeframe and discounted at 2%. This is equivalent to approximately 160 million tons CO<sub>2</sub> equivalent per year. Determining lifecycle GHG emissions values for renewable fuels using a 0% discount rate over 30 years would result in a total of 4.5 billion tons CO<sub>2</sub> equivalent, which is equivalent to an annual average reduction of 150 million tons of CO<sub>2</sub> equivalent. These reductions would be primarily in the form of carbon dioxide, with small contributions from other greenhouse gases. The reductions would be equivalent to taking about 24 million vehicles off the road.

## Emissions and Air Quality

The increased use of renewable fuels can also impact criteria air pollutant emissions, with some pollutants such as hydrocarbons, nitrogen oxides (NO<sub>x</sub>), acetaldehyde and ethanol expected to increase and other pollutants such as carbon monoxide (CO) and benzene expected to decrease. It should be noted that the aggregate nationwide emission inventory impacts presented in today's proposal may not be a good indication of air quality and health impacts, as there can be highly localized impacts such as increased emissions from ethanol plants and evaporative emissions from cars, versus decreased emissions from gasoline refineries.

We project the proposed program will result in significant increases in ethanol and acetaldehyde emissions, increasing the total U.S inventories of these pollutants by 30-40% in 2022 relative to emissions resulting from the RFS1 mandate. We project more modest increases in NO<sub>x</sub>, formaldehyde, particulate matter, hydrocarbons, acrolein, and sulfur dioxide. We project a decrease in ammonia (NH<sub>3</sub>) emissions (due to reductions in livestock agricultural activity), CO (due to

impacts of ethanol on exhaust emissions from vehicles and nonroad equipment), and benzene (due to displacement of gasoline with ethanol in the fuel pool).

Our estimates of the emissions impacts of the RFS2 program took into account both “downstream” emissions from vehicles and engines and “upstream” emissions from the production and distribution of the fuel. Both upstream and downstream emissions are important contributors to the overall nationwide effects.

The atmospheric chemistry related to ambient concentrations of PM<sub>2.5</sub>, ozone and air toxics is very complex, and making predictions based solely on emissions changes is extremely difficult. Full-scale photochemical air quality modeling is planned to characterize the air quality and health impacts of the program in the final rule.

## Overall Petroleum Consumption

EPA’s analysis of the petroleum consumption impacts took a similar lifecycle approach to the assessment of GHG impacts. For the year 2022, we estimate that the 36 billion gallons of renewable fuel mandated by these rules will increase renewable fuel usage by approximately 22 billion gallons over the 2022 base volume scenario which will displace about 15 billion gallons of petroleum-based gasoline and diesel fuel. This represents about 11% of annual gasoline and diesel consumption in 2022, and most of these reductions would result in reduced imports of petroleum.

## Fuel Costs

We cannot predict the selling price of renewable fuels since price fluctuates with demand and is driven by many complex market mechanisms. However, we can estimate the costs associated with producing, transporting, and blending renewable fuels.

The RFS2 program is projected to significantly impact the cost of gasoline and diesel, though the estimated costs vary based on the price of crude oil that we assumed. In our analysis we used both \$92 and \$53 per barrel crude oil based on price projections made by EIA in 2008. At these two crude oil price points, we estimated that gasoline costs would increase by about 2.7 and 10.9 cents per gallon, respectively, by 2022. Likewise, diesel fuel costs could experience a small cost reduction of 0.1 cents per gallon, or increase by about 1.2 cent per gallon, respectively. These costs represent the nationwide average impacts including the costs of producing and distributing both renewable fuels and gasoline and diesel, as well as blending costs, but without consideration of the tax subsidies and import tariff for ethanol or the tax subsidies for biodiesel and renewable diesel fuel.

For the nation as a whole, the increases in gasoline and diesel fuel costs are equivalent to \$4 billion and \$18 billion in 2022 assuming that crude oil is priced at \$92 and \$53 per barrel, respectively (in 2006 dollars, and amortizing capital costs using a 7% before-tax rate of return).

## Economic Impacts and Energy Security

We estimate that 91% of the petroleum reductions resulting from the use of renewable fuel will be met through reductions in net petroleum imports. We estimate the value of the decrease in imported petroleum at about \$16 billion in 2022 due to increased volumes of renewable fuels mandated by RFS2. Net U.S. expenditures on petroleum imports in 2022 are projected to be about \$208 billion.

The above estimate of reduced U.S. petroleum import expenditures only partly assesses the economic impacts of this proposal. One of the effects of increased use of renewable fuel is that it diversifies the energy sources used in making transportation fuel. To the extent that diverse sources of fuel energy reduce the U.S. dependence on any one source, the risks, both financial as well as strategic, of a potential disruption in supply of a particular energy source are reduced. EPA has worked with researchers at Oak Ridge National Laboratory (ORNL) to update a study they previously published that has been used or cited in several government actions impacting U.S. oil consumption. Using the updated ORNL estimate, the total energy security benefits associated with a reduction of U.S. imported oil is \$12.38/barrel. Based upon the \$12.38/barrel figure, total energy security benefits associated with this proposal were calculated and are shown below.

**Total Energy Security Benefits (billions of 2006\$)**

Year	2022
Benefits	\$3.7

## Agricultural Sector Impacts

The RFS program is likely to spur the increased use of renewable transportation fuels made at least initially, principally from agricultural crops and it is expected that most of these crops will be produced in the U.S. As a result, we estimated the change in the price of various agricultural products as a result of this rulemaking. The following table includes 2022 estimates for commodity price increases for corn, soybeans, sugarcane and beef:

**Change in U.S. Commodity Prices for 2022 in Comparison to the Reference Case (2006\$)**

Corn	\$0.15/bushel
Soybeans	\$0.29/bushel
Sugarcane	\$13.34/ton
Beef	\$0.93/hundred pounds

Based on these figures, we estimate that U.S. food costs would increase by \$10 per person per year by 2022 while net U.S. farm income would increase by \$7.1 billion dollars (10.6%).



Due to higher commodity prices, we estimate that U.S. corn exports would drop from 2.7 billion bushels to 2.4 billion bushels (a 10% decrease) by 2022, while U.S. exports of soybeans would decrease from 1.03 billion bushels to 943 million bushels (a 9.3% decrease).

## **For More Information**

For more information on this proposal, including Frequently Asked Questions, please visit the RFS website at: <http://www.epa.gov/otaq/renewablefuels/index.htm>

Or, contact EPA's Office of Transportation and Air Quality, Assessment and Standards Division information line at: [asinfo@epa.gov](mailto:asinfo@epa.gov), or (734) 214-4636