RENEWABLE FUEL STANDARD ASSESSMENT
WHITE PAPER

Greenhouse Gas Emissions and Other Environmental Impacts

The Committee on Energy and Commerce is issuing a series of white papers as the first step in reviewing the renewable fuel standard (RFS). The RFS is a provision of the Clean Air Act that was added by the Energy Policy Act of 2005 and greatly expanded under the Energy Independence and Security Act of 2007 (EISA). It sets targets and timetables for four categories of biofuels to be added into the nation's transportation fuel supply. The four categories are: renewable fuel (corn-derived ethanol and advanced biofuel), advanced biofuel (cellulosic biofuel and biomass-based diesel), cellulosic biofuel, and biomass-based diesel. The targets for the four categories total 16.55 billion gallons for 2013, of which not more than 13.8 billion gallons can be corn ethanol. Corn ethanol is capped at 15 billion gallons from 2015 on, while the other categories of renewable fuel continue to rise until the total RFS reaches 36 billion gallons by 2022.

It has been more than five years since the RFS was last revised, and we now have a wealth of actual implementation experience with it. In some respects, the RFS has unfolded as expected, but in others it has not. Several implementation challenges have emerged that received little if any consideration prior to passage of EISA. Furthermore, the overall energy landscape has changed since 2007. It is time to undertake an assessment of the RFS.

For this reason, the committee is initiating a series of white papers setting out a number of emerging issues with the RFS. Each will provide an overview of an issue and solicit input from interested stakeholders in the form of answers to questions posed. This, the third white paper, addresses the greenhouse gas emissions and other environmental impacts associated with the RFS. Two subsequent RFS white papers will address energy policy considerations, and RIN fraud and other implementation and enforcement issues. In addition, stakeholders will be provided an opportunity to comment on any issues not specifically addressed in the white papers at the conclusion of the process.

Greenhouse Gas Emissions and Other Environmental Impacts - Overview

In addition to enhancing energy security and providing support for rural economies, the RFS was intended to produce environmental benefits from using a cleaner, renewable fuel. In particular, in 2007, the RFS was amended to require the use of rising quantities of advanced biofuels, including cellulosic biofuels, which have substantially lower greenhouse gas emissions and fewer negative environmental impacts, compared to corn-based ethanol or gasoline. The RFS also explicitly requires qualifying renewable fuels to produce specified levels of reductions in greenhouse gas emissions, measured on a life-cycle basis.[1] These greenhouse gas provisions were intended to promote the development and use of transportation fuels with a reduced contribution to climate change.

[1] Clean Air Act, section 211(o)(1)(B), (D), (E), 211(o)(2)(A).

Additionally, the RFS includes several provisions that attempt to limit or address unintended environmental harm from a shift to biofuels. One such provision requires qualifying fuels to be produced from "renewable biomass." The definition of renewable biomass excludes, among other things, the use of planted crops from land newly converted to agriculture and wood from old growth and late successional forests.[2] The provision allowing the EPA Administrator to waive the RFS for one year based on severe economic harm may also be invoked if the EPA Administrator finds there will be severe environmental harm.[3] In addition, the Clean Air Act requires EPA: to complete several studies regarding the effects of the RFS on air quality; to determine whether the RFS will have an adverse impact on air quality; and to promulgate fuel regulations to mitigate any such adverse impacts to the greatest extent achievable, or to determine that no such measures are necessary.[4]

Greenhouse Gas Emissions

The Clean Air Act defines "greenhouse gas" as any one of six listed gases and "any other anthropogenically-emitted gas that is determined by the Administrator…to contribute to global warming."[5] The six listed gases are termed "greenhouse" gases because they trap heat in the atmosphere, similar to a greenhouse. The Act defines "lifecycle greenhouse gas emissions" as:

> …the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.[6]

EPA set out its methodology for determining lifecycle greenhouse gas emissions in a 2010 final rule.[7] The agency estimated that full implementation of the RFS in 2022 would reduce greenhouse gas emissions by138 million tons annually.[8]

To qualify as renewable fuels, corn ethanol and other conventional biofuels from plants constructed after the date of EISA's adoption (December 19, 2007) must achieve at least a 20

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[2] Clean Air Act, section 211(o)(1)(I).
[3] Clean Air Act, section 211(o)(7)(A)(i).
[4] Clean Air Act, section 211(q); 211 (v).
[5] Clean Air Act, section 211(o)(1)(G).
[6] Clean Air Act, section 211(o)(1)(H).
[7] Environmental Protection Agency, *Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program*, March 26, 2010, pp. 14669- 15320, at http://www.gpo.gov/fdsys/pkg/FR-2010-03-26/pdf/2010-3851.pdf; Environmental Protection Agency, *Regulations of Fuels and Fuel Additives: Modifications to Renewable Fuel Standard Program*, December 21, 2010, pp. 79964 – 79978, at http://www.gpo.gov/fdsys/pkg/FR-2010-12-21/pdf/2010-31910.pdf.
[8] Environmental Protection Agency, *EPA Finalizes Regulations for the National Renewable Fuel Standard Program for 2010 and Beyond*, February 2010, at http://www.epa.gov/oms/renewablefuels/420f10007.pdf.

percent reduction in lifecycle greenhouse gas emissions relative to baseline. Corn ethanol produced from plants built before that date is grandfathered in and does not have to achieve any greenhouse gas emissions reductions. To qualify as biomass-based diesel, a fuel must achieve a 50 percent reduction in lifecycle greenhouse gas emissions, cellulosic biofuels must achieve a 60 percent reduction, and advanced biofuels must achieve a 50 percent reduction.[9] There are a large variety of potential feedstocks and production processes used to make renewable fuels, and each must be approved by EPA as meeting the lifecycle greenhouse gas emissions reductions for the relevant renewable fuel category.

Though a critical component of the RFS, the determination of lifecycle greenhouse gas emissions is complex.[10] The best methodology continues to be the subject of considerable debate. A greenhouse gas emissions lifecycle analysis aims to quantify all of the greenhouse gas emissions from producing and using a product, in this case, a fuel. For renewable fuels, this includes emissions from land-use changes if land is converted to grow the feedstocks, emissions associated with producing the fertilizers and other inputs needed to grow the feedstocks, emissions resulting from the production of biofuels, and tailpipe emissions from combusting the final product in vehicles. Similarly, for gasoline, the lifecycle emissions include methane emissions from oil wells, emissions from energy used to extract the oil, emissions from the refining process, and emissions from combusting the final product in vehicles. Absent a lifecycle analysis, it is impossible to tell whether a shift from one fuel source to another actually increases or decreases greenhouse gases overall.

While lifecycle analyses provide substantially better information than simply ignoring all of the upstream emissions of different fuels, the calculations are complex and the results uncertain. A lifecycle analysis must attempt to quantify the effects of a wide range of economic activities conducted by numerous actors. The robustness of the analysis will depend in large part on the quality of the data available. Methodological choices, such as the timeframe over which the lifecycle greenhouse gas assessments apply, also have a significant impact on the outcome.[11]

Particularly controversial is the calculation of emissions attributable to indirect land use changes from producing the feedstocks. EISA requires the RFS lifecycle analysis to account for "significant emissions from land use changes," due to concerns that such emissions could occur and might undercut the climate benefits of the RFS. Diverting acres away from food production to RFS feedstock growth is expected to lead to increased food production elsewhere. Some of this increased production is likely to occur on lands that are newly cleared and converted to agricultural use (including in other nations). Some studies have found that clearing land such as forests and grasslands results in a large near-term release of carbon dioxide so significant as to create a "carbon debt" that may take decades or even centuries of lower-emitting renewable fuel use to overcome.[12] Others argue that the attribution of such a carbon debt to the RFS is highly speculative and there is so much uncertainty regarding the link between the RFS and indirect

[9] Clean Air Act, sections 211(o) (2)(A), 211(o)(1)(D), 211(o)(1)(E), and 211(o)(1)(B).
[10] See, National Research Council, Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy, 2011, pp. 181-251.
[11] Congressional Research Service, Calculation of Lifecycle Greenhouse Gas Emissions for the Renewable Fuel Standard, March 12, 2010, pp. 12-17.
[12] *See, e.g.,* Joseph Fargione, Jason Hill, and David Tilman, et al., "Land clearing and the biofuel carbon debt," *Science*, vol. 319 (February 29, 2008).

land use change, as well as the size of any emissions impacts, that it should not be included in lifecycle analyses.[13]

Other Environmental Considerations

The Clean Air Act directs EPA to analyze and take steps to mitigate any adverse impacts of the RFS on air quality. Increased use of renewable fuels is believed to result in reduced emissions of some regulated air pollutants but increases in others, relative to petroleum-derived fuels. EPA's 2010 Regulatory Impact Analysis for the RFS projected lower air toxics but higher fine particulate matter and ozone, and an increase in annual mortality of up to 245 in 2022 with full implementation of the RFS.[14] EPA's detailed analysis of the air quality impacts of the RFS was due in June 2009, and it is in progress but has not been completed.[15] Until it is completed, the agency cannot promulgate the required regulations to mitigate any adverse impacts identified in the study. These regulations, or a determination that no such measures are necessary, were due no later than December 19, 2010.[16]

More broadly, EPA is also required under EISA to report to Congress every three years on the environmental and resource conservation impacts of the RFS.[17] These non-greenhouse gas environmental issues include "air quality, effects on hypoxia, pesticides, sediment, nutrient and pathogen levels in waters, acreage and function of waters, and soil environmental quality."[18] The resource conservation issues include "soil conservation, water availability, and ecosystem health and biodiversity, including impacts on forests, grasslands, and wetlands." The report must also include an assessment of "the growth and use of cultivated invasive or noxious plants and their impacts on the environment and agriculture."[19]

EPA's First Triennial Report to Congress was issued in December 2011. Based on a review of the scientific literature through July 2010, it found a number of these negative impacts, especially at the feedstock production stage, but characterized them as limited in magnitude.[20] The agency is currently working on the next triennial report.

Questions for Stakeholder Comment

1. Is the RFS reducing greenhouse gas emissions below that of baseline petroleum-derived fuels? Is the RFS incentivizing the development of a new generation of lower greenhouse

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[13] Id. at 9-11.
[14] Environmental Protection Agency, EPA Finalizes Regulations for the National Renewable Fuel Standard Program for 2010 and Beyond, February 2010, at http://www.epa.gov/oms/renewablefuels/420f10007.pdf.
[15] Clean Air Act, section 211(v)(1).
[16] Clean Air Act, section 211(v)(2).
[17] Energy Independence and Security Act of 2007, section 204.
[18] Id.
[19] Id.
[20] Environmental Protection Agency, Biofuels and the Environment: First Triennial Report to Congress, December 2011, p. xiv.

gas emitting fuels? Will the RFS produce further greenhouse gas emissions reductions when it is fully implemented?

2. Could EPA's methodology for calculating lifecycle greenhouse gas emissions be improved, including its treatment of indirect land use changes? If so, how?

3. Is the definition of renewable biomass adequate to protect against unintended environmental consequences? If not, how should it be modified?

4. What are the non-greenhouse gas impacts of the RFS on the environment relative to a comparable volume of petroleum-derived fuels? Is there evidence of a need for air quality regulations to mitigate any adverse impacts of the RFS?

5. Has implementation of the RFS revealed any environmental challenges or benefits not fully anticipated in the statute?

6. What is the optimal percentage of ethanol in gasoline? What is the optimal percentage of biomass-based diesel in diesel fuel?

7. What are the best options for substantially further reducing greenhouse gas emissions from the transportation sector? Is the RFS an important component of such efforts?

Please respond by May 24, 2013, to RFS@mail.house.gov. Should you have any questions, you may contact Majority staff Ben Lieberman at (202) 225-2927, or Minority staff Alexandra Teitz at (202) 225-4409.