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# Renewable Fuel Standard Program (RFS-2)

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May 6, 2010



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# Key Changes Required by EISA

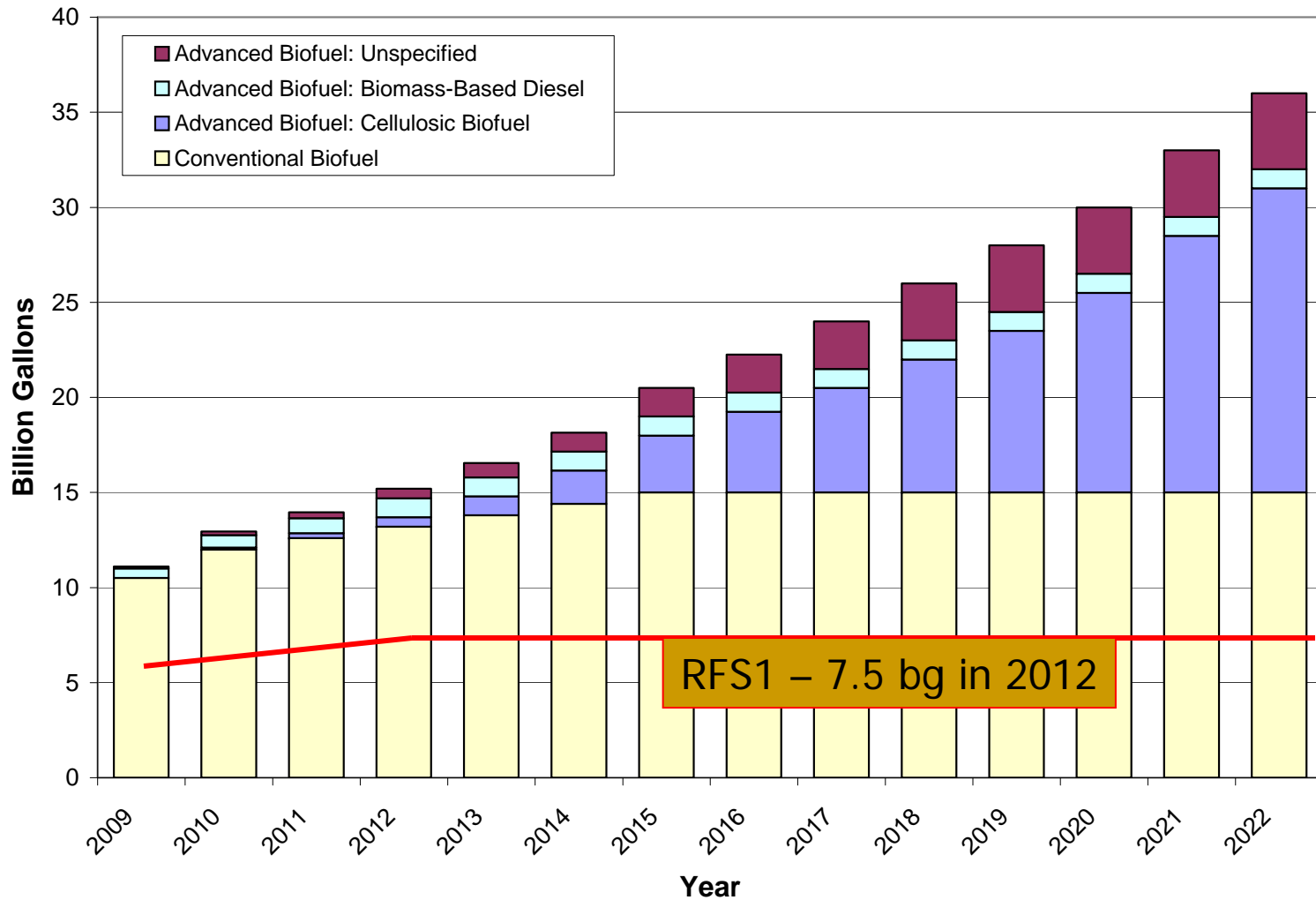
- **Energy Independence and Security Act (EISA, December 2007) required changes to the RFS program**
  - Significantly increased volumes of renewable fuel – to 36 billion gallons
  - Separation of the volume requirements into four separate categories of renewable fuel: cellulosic biofuel, biomass-based diesel, advanced biofuel, total renewable fuel
  - Changes to the definition of renewable fuels to include minimum lifecycle GHG reduction thresholds and grandfathering of volume from certain facilities
  - Restrictions on the types of feedstocks that can be used to make renewable fuel, and the types of land that can be used to grow and harvest feedstocks
  - Inclusion of specific types of waivers and EPA-generated credits for cellulosic biofuel

# What are the Four Categories and Standards?

- **Four Separate Standards**
  - **Biomass-Based Diesel: 1 Bgal by 2012 and beyond**
    - E.g., Biodiesel, “renewable diesel” if fats and oils not co-processed with petroleum
    - Must meet a 50% lifecycle GHG threshold
  - **Cellulosic Biofuel: 16 Bgal by 2022**
    - Renewable fuel produced from cellulose, hemicellulose, or lignin
    - E.g., cellulosic ethanol, BTL diesel, green gasoline, etc.
    - Must meet a 60% lifecycle GHG threshold
  - **Advanced Biofuel: Total of 21 Bgal by 2022 (Minimum of 4 billion additional)**
    - Essentially anything but corn starch ethanol
    - Includes cellulosic biofuels and biomass-based diesel
    - Must meet a 50% lifecycle GHG threshold
  - **Renewable Biofuel: Total of 36 Bgal by 2022 (Minimum of 15 Bgal additional)**
    - Ethanol derived from corn starch – or any other qualifying renewable fuel
    - Must meet 20% lifecycle GHG threshold - Only applies to fuel produced in new facilities

**NOTE: Existing biofuel facilities (domestic and foreign) are not required to meet GHG threshold for conventional biofuel category – facilities are “Grandfathered.”**

# RFS-2 Volumes



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# Facility Grandfathering

- **All post-enactment facilities (domestic and foreign) must meet minimum 20% GHG reduction**
- **All pre-enactment facilities (domestic and foreign) are grandfathered for the general renewable fuel category – estimated at ~15 Bgal**
  - Including ethanol facilities that start production in calendar years 2008 and 2009, and are fired with natural gas, biomass, or any combination
- **Volume increases beyond the baseline must meet the 20% threshold like a new facility**

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# Renewable Biomass Provisions – Approving Feedstocks

- **EISA restricted where feedstocks can grow and be harvested for use in producing renewable fuels for compliance with the RFS2 program**
  - Planted crops/crop residue from ag land cleared/cultivated prior to Dec. 2007
  - Planted trees/tree residue from nonfederal lands and tree plantations cleared/cultivated prior to Dec. 2007

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# Lifecycle GHG Emissions

## Lifecycle GHG analysis is integral to the new RFS2 standards

- Without a determination of whether a fuel does or does not comply with the thresholds, the program cannot be implemented

## From the statute (EISA):

“The term ‘**lifecycle greenhouse gas emissions**’ means 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 the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.”

# Compliance Determination from LCA Results

- **Modeling accounts for the typical feedstock and fuel production pathways from which significant production and contribution to RFS2 volumes are expected (2022)**
- **Modeled fuel pathways that comply:**
  - Ethanol produced from corn starch at a new natural gas, biomass, or biogas fired facility using advanced efficient technologies meets 20% threshold (Coal-fired will not comply)
  - Butanol from corn starch meets 20% threshold
  - Biodiesel (soy, wastes, algae) meets 50% threshold
  - Sugarcane ethanol (multiple pathways) meets 50% threshold
  - Cellulosic ethanol & diesel fuel (Thermal and Biochemical processing of stover, switchgrass) meets 60% threshold
- **Results were extended to fuel pathways with the same fuel type and feedstock as those modeled, but with feedstock production sources that were not included in the analysis (e.g., corn ethanol and soybean biodiesel produced in another country)**
  - If agricultural production sources are significantly different from those modeled and fuel volumes from the source increase, EPA retains the authority to perform a full analysis of the different pathway for compliance determination
- **Results extended to other fuel pathways with low risk of not complying:**
  - Crop residues (e.g. corn stover, wheat straw, rice straw, and citrus residue) providing starch or cellulosic feedstock
  - Forest material (including eligible forest thinnings and solid residue remaining from forest product production) providing cellulosic feedstock
  - Secondary annual crops planted on existing crop land (i.e. winter cover crops) and providing cellulosic material, starch, or oil for biofuel production
  - Separated food and yard wastes, including food and beverage wastes from food production and processing
  - Perennial grasses including switchgrass and miscanthus



# Approach Going Forward for Qualifying Additional Fuels Based on Lifecycle Modeling

- **Threshold determinations for certain other pathways were not possible at the time of the final rule because sufficient modeling or data was not yet available**
- **EPA was not able to complete modeling the following fuel pathways in time for the February final rule but is doing so in a follow-up rulemaking:**
  - Wood pulp ethanol
  - Grain sorghum ethanol
  - Palm oil biodiesel
  - Canola oil biodiesel
- **For other fuel pathways not yet modeled, EPA provides a petition process to facilitate their timely analysis and provide a compliance determination.**
  - For fuel pathways sufficiently similar to those that have been modeled (e.g., energy enhancement to fuel processing technology)
    - Upon determination, allow RIN-generation after next quarterly update of RIN reporting system
    - Determinations will then be formalized in regulations during annual rulemaking process
  - For fuel pathways that require significant new analysis and modeling (e.g., new feedstock or fuel type)
    - EPA would give notice and seek public comment
    - Carried out as part of annual rulemaking process
- **EPA recognizes that the state of scientific knowledge continues to evolve in this area; therefore, the Agency is committing to further reassess these determinations and lifecycle estimates**
  - EPA will request that the National Academy of Sciences over the next two years evaluate the approach taken in this rule, the underlying science of lifecycle assessment, and in particular indirect land use change, and make recommendations for subsequent rulemakings on this subject
  - This new assessment could result in new determinations of threshold compliance compared to those included in this rule that would apply to future production (from plants that are constructed after each subsequent rule)

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# Overview of Impacts of the RFS2 Program

## ■ **Petroleum Consumption, Energy Security and Fuel Costs:**

- We estimate this program will replace about 7 percent of expected annual gasoline and diesel consumption in 2022
- Decrease oil imports by \$41.5 billion
- Result in additional energy security benefits of \$2.6 billion.

## ■ **Greenhouse Gas Emissions:**

- When fully implemented in 2022, renewable fuels are expected to reduce greenhouse gas emissions by 138 million metric tons -- equivalent to the annual emissions of 27 million passenger vehicles.

## ■ **Agriculture Sector and Related Impacts:**

- In 2022, the increased use of renewable fuels is expected to expand the market for agricultural products such as corn and soybeans and open new markets for advanced biofuels – increasing net farm income by an estimated \$13 billion dollars in 2022.

## ■ **Emissions and Air Quality:**

- Increased use of renewable fuels will also impact emissions.
- Some emissions such as NO<sub>x</sub>, acetaldehyde, and ethanol are expected to increase and others such as benzene and carbon monoxide are expected to decrease.
- The impacts of these emissions on criteria air pollutants will vary from area to area.
- EISA directs the agency to further evaluate these potential impacts and to mitigate, to the extent possible, any adverse impacts.

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# Questions?

- For additional information: [www.epa.gov/otaq/renewablefuels/index.htm](http://www.epa.gov/otaq/renewablefuels/index.htm)
  - Factsheets
  - RFS2 Rulemaking Package
    - Preamble
    - Regulations
    - Regulatory Impact Analysis
  - Links to Other Information
  - Frequently Asked Questions
  
- Send new questions to: [EPAFuelsPrograms@epa.gov](mailto:EPAFuelsPrograms@epa.gov)