The Future of the RFS and Its Impact on the Syngas Industry

A presentation for the Global Syngas Conference
Austin, TX | Tuesday, October 29, 2019 | 2:45 p.m.
Disclaimer

This presentation is for informational purposes only and is not intended to represent legal or financial advice. It is meant to spark discussion, not to be a comprehensive recitation of all relevant considerations.

You should contact your attorney or financial advisor to obtain advice with respect to any particular issue or problem.
Two Myths and a Truth

• The federal Renewable Fuel Standard dies after 2022.
• Syngas is not eligible to generate credits under the Renewable Fuel Standard.
• Getting a new pathway approved can be time-consuming . . . but far from impossible.
Overview

• History of RFS and RFS2
• RFS Mechanics
• Two Potential Routes for Syngas: Renewable Electricity
• Renewable Electricity Approval . . . in Theory
• Requirements in 2014 Rule
• Renewable Electricity Since 2014
• 2019 D3 RVO
• Statutory Volumes
• Market Overview
• Supply and Demand for Renewable Electricity under RFS
• Historical D3 RIN Prices
• Need for EPA Clarification
• Projected EV and FCV Markets
• Conclusion
History of RFS and RFS2


  - Section 210(o) of the Clean Air Act, 42 U.S.C. § 7545(o).

  - Regulations at 40 CFR Part 80, subpart M.

- Purpose: to **increase production** of clean renewable fuels and bolster the nation’s **energy independence and security**.
RFS Mechanics

• Requires refiners and importers of fossil transportation fuels to incorporate an increasing percentage of approved renewable fuels.
  
  • This increasing percentage = Renewable Volume Obligation (RVO)
  
  • Congressional targets v. EPA standards
  
  • Categories of RVO

• Obligated parties meet RVOs by physically blending renewable and fossil fuels (e.g., renewable ethanol in gasoline) or by purchasing and retiring renewable fuel credits called “Renewable Identification Numbers” (RINs).
  
  • Categories of RINs
RFS Mechanics

• Approved feedstock → approved process → approved fuel → transportation use.
  
  • Other permissible uses: certain home heating applications and jet fuel.

• “Renewable fuels” must come from “renewable biomass” (see definitions at 42 U.S.C. § 7545(o)(1)).

<table>
<thead>
<tr>
<th>Certain planted crops and crop residue</th>
<th>Trees from actively managed plantations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal waste materials and byproducts</td>
<td>Forestland slash and commercial thinnings</td>
</tr>
<tr>
<td>Biomass removed near bldgs. to prevent wildfire</td>
<td>Algae</td>
</tr>
<tr>
<td>Separated yard or food waste</td>
<td></td>
</tr>
</tbody>
</table>

• Must demonstrate greenhouse gas reductions versus fossil gasoline and diesel.
RFS Mechanics

• Producers must be registered to generate RINs (40 CFR § 80.1450).
  
  • Must submit detailed information about: feedstock, process flow, co-products, quantity, heat content, and percent efficiency of transfer (as applicable), and any conversion factors.
  
  • Copies of all contracts or affidavits tracking from generation to transportation use.

• Concern about fraud.
RFS Mechanics

<table>
<thead>
<tr>
<th>D-codes</th>
<th>Type</th>
<th>Greenhouse gas reductions</th>
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<tbody>
<tr>
<td>3</td>
<td>Cellulosic biofuel</td>
<td>60%</td>
</tr>
<tr>
<td>4</td>
<td>Biomass-based diesel</td>
<td>50%</td>
</tr>
<tr>
<td>5</td>
<td>Advanced biofuel</td>
<td>50%</td>
</tr>
<tr>
<td>6</td>
<td>Renewable fuel</td>
<td>20%</td>
</tr>
<tr>
<td>7</td>
<td>Cellulosic diesel</td>
<td>60%</td>
</tr>
</tbody>
</table>

RFS Mechanics

![Renewable Fuel Standard Volumes by Year](chart.png)
Two Potential Routes for Syngas: Produce Electricity or H₂ for Fuel Cells

- Remember: key links are (1) renewable biomass feedstock; (2) reduced GHG lifecycle emissions compared to fossil baseline; (3) and transportation use.

- Likeliest uses for syngas:
  - Electricity production
  - H₂ production for fuel cells

- Eligible now: any syngas process that generates renewable electricity from biogas from –
  - landfills, municipal wastewater treatment facility digesters, agricultural digesters, and separated MSW digesters; cellulosic components of biomass processed in other waste digesters.

- Gasification currently approved to produce renewable gasoline, RBOB and naphtha from a variety of feedstocks, including separated municipal solid waste

- H₂ not currently approved, though EPA is considering approval of H₂ production from methane cracking and from steam methane reforming.
Renewable Electricity Approval

- In 2014 EPA approved as “cellulosic biofuel” renewable electricity produced from biogas from landfills, wastewater treatment sludge and animal manure.

- The rulemaking addressed the following:
  - Who is the “producer” and RIN generator?
  - **How to track** electricity from production to transportation use?
  - **What documentation** is required?
  - What about electricity produced from solid fuel biomass?
Requirements in 2014 Rule

- **No requirement to purchase** power or RECs.
  - “We have made the decision to match generation to use, and not require the purchase or definition of related environmental attributes.” 79 Fed. Reg. 421278, 42144 (July 18, 2014).
  - Participation in RFS does not preclude generation of RECs.

- **Affidavits sufficient** to prove use in transportation.
  - “These provisions allow for the use of signed affidavits . . . . It is assumed that these affidavits would be signed by fleet managers or vehicle operators, verifying the use of the renewable transportation fuel.” 79 Fed. Reg. 42128, 42144 (July 18, 2014).
  - But must show connection between sellers and users.

- Loaded & withdrawn from **physically connected transmission grid**.
- **Production matches consumption**.
- **No double counting**.
Since 2014 EPA has received many renewable electricity registration requests pursuant to 40 CFR § 80.1450. None approved to date.

EPA promulgated the proposed Renewables Enhancement and Growth Support (REGS) rule in late 2016. Instead of going case-by-case, EPA proposed to take comments on a systematic approach.

EPA extended comment period but has yet to take action on the rule.
# Volume Standards as Set Forth in EISA [billion gallons]

*EPA sets actual standards each November; standards below are as published in the Act*

<table>
<thead>
<tr>
<th>Year</th>
<th>Conventional Renewable Fuels (D6)</th>
<th>Advanced Biofuels (D3, D4, D5)</th>
<th>Total Renewable Fuels (D3, D4, D5, D6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cellulosic Biofuel (D3)</td>
<td>Biomass-Based Diesel (D4)</td>
<td>Non-Cellulosic Advanced (D5)</td>
</tr>
<tr>
<td>2008</td>
<td>9.0</td>
<td></td>
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<tr>
<td>2009</td>
<td>10.5</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>2010</td>
<td>12.0</td>
<td>0.1</td>
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</tr>
<tr>
<td>2011</td>
<td>12.6</td>
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<tr>
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<td>15.0</td>
<td>4.25</td>
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<td>2017</td>
<td>15.0</td>
<td>5.5</td>
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<td>2018</td>
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<td>15.0</td>
<td>8.5</td>
<td>1.0</td>
</tr>
<tr>
<td>2020</td>
<td>15.0</td>
<td>10.5</td>
<td>1.0</td>
</tr>
<tr>
<td>2021</td>
<td>15.0</td>
<td>13.5</td>
<td>1.0</td>
</tr>
<tr>
<td>2022</td>
<td>15.0</td>
<td>16.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Approximately 227MM D3 RINs were generated in 2017.
2019 Renewable Volume Obligation for Cellulosic Fuels (D3 Market)

2019 Renewable Volume Obligation (in gallons)
- Cellulosic Biofuel (381 million)
- Biomass Based Diesel
- Advanced Biofuel
- Renewable Fuel
- Implied Conventional Biofuel

Cellulosic Biofuels with Electricity
- 2019 Cellulosic Obligation (381 million)
- Electricity (104 million)
Historical D3 RIN Prices
Projected EV and FCV Markets

- **Multiple factors** influence projected EV market: petroleum prices; technology improvements and cost reduction; government policy; consumer sentiment; etc.

- Various entities have tried to estimate the percentage of EVs under various scenarios.

- *Bloomberg New Energy* estimates **EVs** will account for about 4% of new car sales in US by 2021 and about 54% by 2040.

- **Grand View Research, Inc.** estimates that **US fuel cell vehicle sales** will surpass $1.75 billion by 2025.
Conclusion

• Despite 2014 rule approving the renewable electricity pathway, EPA has yet to register producers for e-RIN generation.

• As EVs become more prevalent, **e-RIN potential increases**.

• Renewable electricity produced from renewable biomass is poised to become significant market player.

• Growing fuel cell vehicle market will mean growing market for $H_2$.

• EPA is currently evaluating petitions for $H_2$ as an approved renewable fuel (from renewable biogas via steam methane reforming and via methane cracking). If approved, will set an important precedent for additional $H_2$ fuel pathways.