National Renewable Fuel Standard Program – 2010 and Beyond

2010 Energy Conference
April 6 & 7, 2010

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Overview

- National Renewable Fuel Standards as Required by EISA
- Key Highlights of the RFS2 Rule
- The 2010 Standards
- Example RFS2 2022 Projections
- EISA Waiver Authorities
- Conclusions / Questions

Key Changes Required by EISA

- **Energy Independence and Security Act (December 2007) required changes to the RFS program**
  - Significantly increased volumes of renewable fuel – to 36 billion gallons
  - Expanded from on road gasoline to on and off-road gasoline and diesel
  - 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

Highlights of the New RFS2 Program

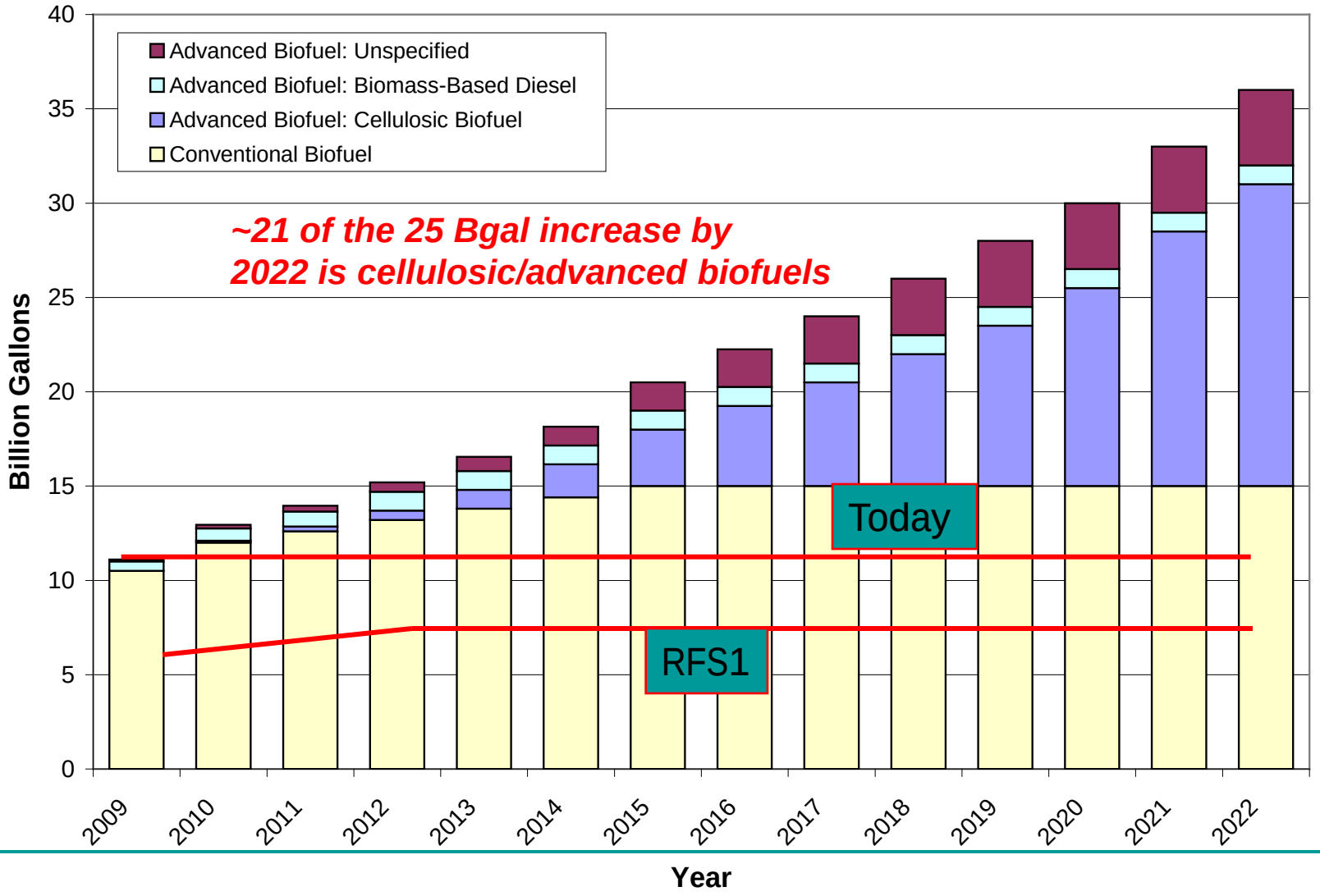
- **Final rule set full 2010 EISA renewable fuels volume = 12.95 Billion Gallons**
- **The new RFS2 Regulations go into effect July 1, 2010.**
- **EPA has developed a path for transitioning from RFS1 to RFS2**
- **The rule also establishes volume standards for specific categories of renewable fuels.**
- **Implements several key EISA definitions:**
  - **Renewable Biomass: Fuels must be made from feedstock that meet the Act's specific conditions for the new category and also meet the definition of renewable biomass**
  - **GHG Reductions: Demonstrate they meet certain minimum greenhouse gas reduction standards, based on lifecycle assessment, in comparison to the petroleum fuels they displace (2005 baseline).**
- **Rule also provides a process to efficiently evaluate and establish new fuels and feedstocks**
- **Rule maintains several key components of RFS1 program, including energy based approach.**

EISA Categories and Standards

- **Four Separate Standards**
  - **Biomass-Based Diesel: Minimum of 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: Minimum of 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: Minimum 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
  - **Total Renewable Biofuel**: **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."

Cellulosic / Advanced Biofuels: Primary Expansion Fuels in RFS-2



Volume Standards as Set Forth in EISA

(Reminder: EPA Sets Standards Each November – These are the standards published in the Act)

Conventional Renewable Fuels + Total Advanced = Total Renewable Fuel

Advanced Biomass Based Diesel + Non Cellulosic Advanced + Cellulosic Advanced = Total Advanced

Year	Conventional Renewable Fuels (Grandfathered Or 20% Reduction)	Advanced Biofuel NESTED STANDARDS				Total Renewable Fuel
		Biomass-Based Diesel (50% Reduction)	Non Cellulosic Advanced (50% Reduction)	Cellulosic Biofuel (60% Reduction)	Total Advanced Biofuel	
2008	9.00					9.0
2009	10.50	0.5	0.1		0.6	11.1
2010	12.00	0.65	0.2	0.1	0.95	12.95
2011	12.60	0.80	0.3	0.25	1.35	13.95
2012	13.20	1.0	0.5	0.5	2.0	15.2
2013	13.80	1.0	0.75	1.0	2.75	16.55
2014	14.50	1.0	1.00	1.75	3.75	18.15
2015	15.00	1.0	1.50	3.0	5.5	20.5
2016	15.00	1.0	2.00	4.25	7.25	22.25
2017	15.00	1.0	2.50	5.5	9.0	24.0
2018	15.00	1.0	3.00	7.0	11.0	26.0
2019	15.00	1.0	3.50	8.5	13.0	28.0
2020	15.00	1.0	3.50	10.5	15.0	30.0
2021	15.00	1.0	3.50	13.5	18.0	33.0
2022	15.00	1.0	4.00	16.0	21.0	36.0

2010 Standards as Set By EPA

- **Total Renewable Fuel Standard -** Applying EISA full 2010 RFS2 standard – 12.95 billion gallons
  - Most straightforward interpretation of the Act
- **Biomass-based Diesel Standard -** Final rule combines 2009 0.5 billion gallon biomass-based diesel requirement with 2010 0.65 billion gallon requirement
- **Cellulosic Standard -** Based on updated market assessment – EPA is setting a 6.5 million gallon standard for 2010
  - Process: Each November, EPA sets actual standard for following year
  - Based on EIA's annual production assessment and other market assessments
  - Done by notice and comment
- **Total Advanced Standard -** Maintained at 0.95 billion gallons
  - Expected to be met in 2010 with biomass-based diesel compliance (0.65*1.5 = 0.975)

RFS2 Volume Standards for 2010
- Presented as Volume and Percentage

Standards for 2010

Fuel Category	Percentage of Fuel Required to be Renewable	Volume of Renewable Fuel (in billion gal)
Cellulosic biofuel	0.004%	0.0065
Biomass-based diesel	*1.10%	*1.15
Total Advanced biofuel	0.61%	0.95
Renewable fuel	8.25%	12.95

**Combined 2009/2010 Biomass-Based Diesel Volumes Applied in 2010*

Overview: Current Renewable Fuel GHG Qualification Determinations

- **Modeling accounts for the typical feedstock and fuel production pathway from which significant production and contribution to RFS2 volumes are expected (2022)**

- **Modeled pathways meeting compliance**

Renewable Fuel Category	Example of Qualifying Renewable Fuel
Cellulosic (60% GHG)	Cellulosic ethanol and diesel fuel (Thermal / Biochemical from Stover and Switchgrass)
Biomass-based diesel (50% GHG)	Biodiesel from soy, wastes oils, and algae
Advanced biofuel (50% GHG)	Ethanol from sugarcane
Renewable fuel (20% GHG or Grandfathered)	Ethanol and Butanol from corn starch

- **Results extended to same fuel type and feedstock as a modeled pathway (International Application)**

- **Results extended to other fuel pathways with low risk of not complying**

Pre-EISA AEO 2007 Reference Case

(Illustrative)

Table 1.2-1. AEO 2007 Reference Case Renewable Fuel Volumes (billion gallons)

	Advanced Biofuel			Non-Advanced Biofuel	Total Renewable Fuel
	Cellulosic Biofuel	Biomass-Based Diesel[a]	Other Advanced Biofuel		
Year	Cellulosic Ethanol[c]	FAME Biodiesel[b]	Imported Ethanol	Corn Ethanol	
2010	0.12	0.32	0.29	10.49	11.22
2011	0.19	0.33	0.16	10.69	11.37
2012	0.25	0.33	0.18	10.81	11.57
2013	0.25	0.33	0.19	10.93	11.70
2014	0.25	0.23	0.20	11.01	11.69
2015	0.25	0.25	0.39	11.10	11.99
2016	0.25	0.35	0.51	11.16	12.27
2017	0.25	0.36	0.53	11.30	12.44
2018	0.25	0.36	0.54	11.49	12.64
2019	0.25	0.37	0.58	11.69	12.89
2020	0.25	0.37	0.60	11.83	13.05
2021	0.25	0.38	0.63	12.07	13.33
2022	0.25	0.38	0.64	12.29	13.56

[a] Biomass-Based Diesel could include FAME biodiesel, cellulosic diesel, and non-co-processed renewable diesel.

[b] Only fatty acid methyl ester (FAME) biodiesel volumes were considered

[c] AEO 2007 reference case assumes actual production of cellulosic biofuel (i.e. not corn ethanol plants utilizing 90% biomass for energy) and therefore was assumed to be 0.25 billion gallons.

RFS2: Primary Control Case in 2022

(Illustrative)

Table 1.2-3.
Primary Control Case Projected Renewable Fuel Volumes (billion gallons)

Year	Advanced Biofuel						Non-Advanced Biofuel	Total Renewable Fuel[f]
	Cellulosic Biofuel		Biomass-Based Diesel[a]		Other Advanced Biofuel			
	Cellulosic Ethanol	Cellulosic Diesel[b]	FAME[c] Biodiesel	NCRD[d]	Other Biodiesel[e]	Imported Ethanol	Corn Ethanol	
2010	0.03	0.04	0.61	0.04	0.22	0.29	11.24	12.48
2011	0.08	0.10	0.72	0.08	0.17	0.16	12.07	13.38
2012	0.15	0.20	0.92	0.08	0.12	0.18	12.83	14.48
2013	0.31	0.41	0.92	0.08	0.28	0.19	13.42	15.61
2014	0.54	0.71	0.85	0.15	0.39	0.20	14.09	16.93
2015	0.92	1.22	0.85	0.15	0.53	0.39	14.79	18.85
2016	1.31	1.73	0.85	0.15	0.56	0.63	15.00	20.23
2017	1.69	2.24	0.85	0.15	0.60	1.07	15.00	21.60
2018	2.15	2.85	0.85	0.15	0.64	1.51	15.00	23.15
2019	2.61	3.46	0.85	0.15	0.68	1.96	15.00	24.71
2020	3.23	4.28	0.85	0.15	0.72	1.88	15.00	26.11
2021	4.15	5.50	0.85	0.15	0.77	1.81	15.00	28.23
2022	4.92	6.52	0.85	0.15	0.82	2.24	15.00	30.50

[a] Biomass-Based Diesel could include FAME biodiesel, cellulosic diesel, and non-co-processed renewable diesel.
[b] Cellulosic Diesel includes 1.96 billion gallons from Fischer-Tropsch Biomass-to-Liquids (BTL) processes and 4.56 billion gallons from this or other types of cellulosic diesel processes in year 2022. In order to calculate the split of cellulosic ethanol vs. cellulosic diesel in years prior to 2022, we assumed the same percentage of the total cellulosic biofuel standard as in year 2022, i.e. 31% cellulosic ethanol and 69% cellulosic diesel.
[c] Fatty acid methyl ester (FAME) biodiesel
[d] Non-Co-processed Renewable Diesel (NCRD)
[e] Other Biodiesel is biodiesel that could be produced in addition to the amount needed to meet the biomass-based diesel standard.
[f] May not total due to rounding.

EISA Waiver Authorities

General

- **Anyone subject to requirements can petition waiver or relaxation of the four standards**
  - Severe harm to the economy; Inadequate supply
  - EPA must approve or disapprove within 90 days but requires opportunity for notice and comment
  - Limited to one year, but can be renewed

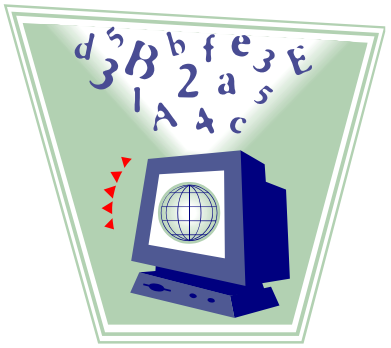
Biomass Based Diesel

- **EPA, in consultation with DOE and USDA, can lower the standard in the Act (60 day period)**
  - If significant feedstock disruption or other market circumstances lead to significant price increase of BBD
  - Up to 15% of standard or 30% if renewed
  - Can reduce advanced biofuel and total renewable fuel standards accordingly

Cellulosic Biofuel Standard

- **Irrespective of the volumes required in the Act**
  - Administrator must set the cellulosic standard each November for the following year “Based on" October EIA projections
  - If cellulosic standard is set less than volume required in Act EPA must make EPA Cellulosic Biofuel Credits available for sale at the greater of
    - 25 cent/gallon – or value greater than 25 c/gal based on calculation:
    - $3.00 per gallon less the wholesale price of gasoline (adjusted for inflation)
    - (Example 1: $3.00 – 2.82 = .18 c/gal) - Since this is less than 25c/g, it would default to .25 c/gal
    - Example 2: (Example 1: $3.00 – 1.80 = 1.20 c/gal) - Since this is more than 25c/g, the credit would sell for $1.20 c/gal
  - EPA can reduce the standards for advanced biofuel and total renewable fuel accordingly

Questions?



- For Additional information: http://www.epa.gov/otaq/renewablefuels/index.htm
  - Includes Factsheets
  - RFS2 Rulemaking Package
    - Preamble
    - Regulations
    - Regulatory Impact Analysis
  - Links to Other Information
  - Frequently Asked Questions

- Send new questions to: EPAFuelsPrograms@epa.gov