

Overview of Renewable Fuel Standard

Dairy and Livestock Working Group

Dairy Digester Subgroup #2

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Introduction to Renewable Fuel Standard

Overview

- Legislative history: EPLA (2005); updated via Energy Independence and Security Act (EISA, 2007)
- The Renewable Fuel Standard (RFS2) mandates biofuel volumes that must be blended into transportation fuel each year from 2006 to 2022.
- EPA forecasts transportation fuel volumes using data from EIA.
- Renewable fuel volume obligations (RVOs) are expressed as a percentage of expected nationwide fuel consumption.
- EPA is required to set standards by 11/30.

Year	Total Renewable Fuels	cap on corn ethanol	Advanced biofuels			
			total non-corn starch	cellulosic	biomass-based diesel	other
2010	12.95	12.0	0.95	0.0065	1.15 ^c	0.29
2011	13.95	12.6	1.35	0.006	0.80	0.54
2012	15.20	13.2	2.00	0.000	1.00	1.00
2013	16.55	13.8	2.75	0.006	1.28	1.46
2014	16.28	13.6	2.67	0.033	1.63	0.143
2015	16.93	14.1	2.88	0.123	1.73	0.093
2016	18.11	14.5	3.61	0.230	1.90	0.454
2017	19.28	15.0	4.28	0.311	2.00	0.889
2018	26.00	15.0	11.00	7.00	2.10	TBD
2019	28.00	15.0	13.00	8.50	≥1.00	3.50
2020	30.00	15.0	15.00	10.50	≥1.00	3.50
2021	33.00	15.0	18.00	13.50	≥1.00	3.50
2022	36.00	15.0	21.00	16.00	≥1.00	4.00

Introduction to Renewable Fuel Standard, ctd

Overview

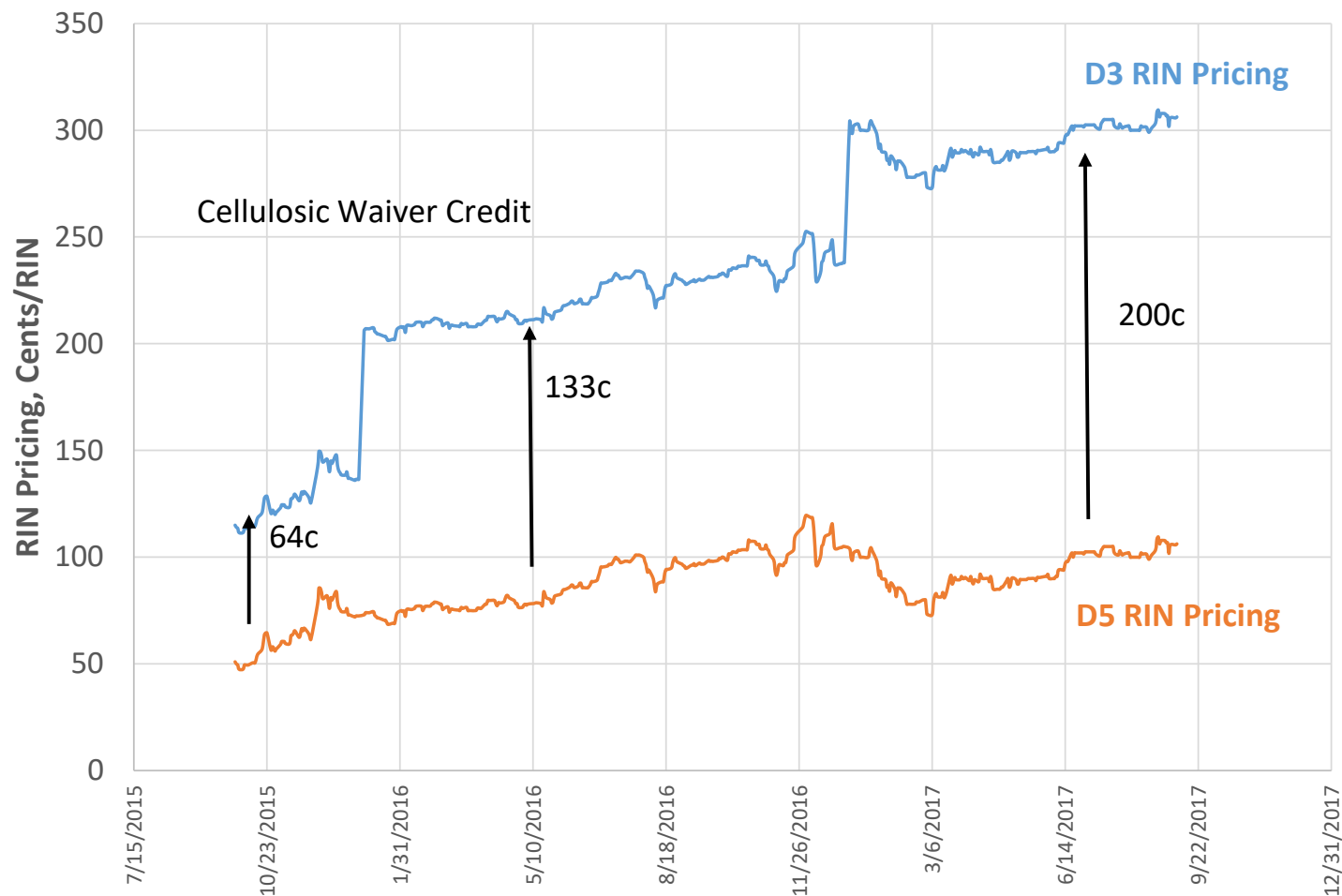
- Program currency is Renewable Identification Numbers (RINs)—reported in units of ethanol gallons.
1 RIN = 1 ethanol gallon
- Program has “nested categories”:

RIN Type	Description / Biofuel	Min GHG Reductions	RFS qualifying categories
D3	cellulosic biofuel	≥60% GHG savings	cellulosic, advanced or renewable
D4	biomass-based diesel	≥50% GHG savings	biomass-based diesel, advanced or renewable
D5	advanced biofuel	≥50% GHG savings	advanced or renewable
D6	renewable fuel	≥20% GHG savings	renewable
D7	cellulosic diesel	≥60% GHG savings	cellulosic or advanced, biomass-based diesel, or renewable

- **EPA designated biogas as an eligible renewable fuel in 2013; generates D3 or D5 RINs depending on renewable content (e.g., substrate for digestion)**

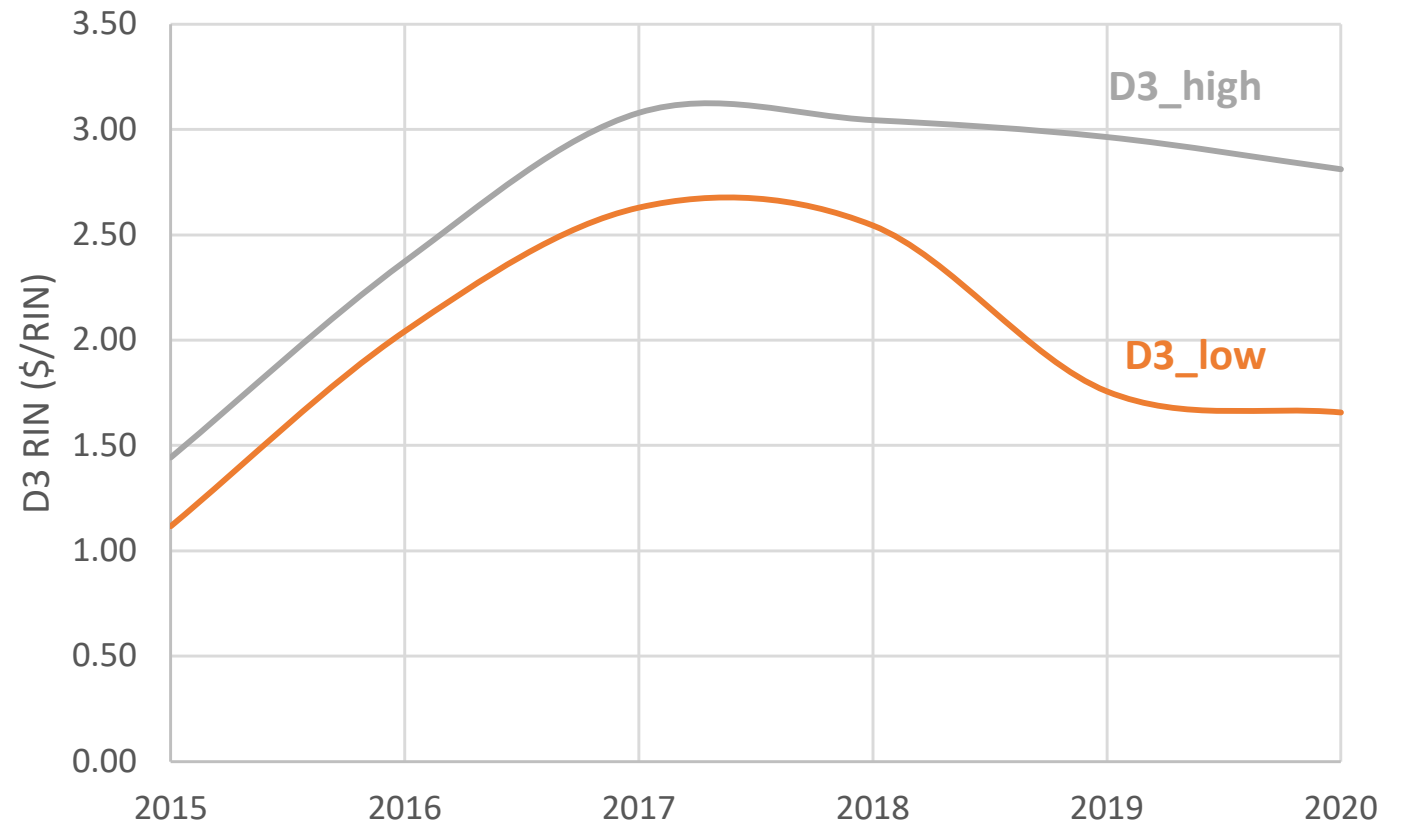
RIN Pricing

- D3 RINs have unique pricing constraints
- D3 RINs can be “retired” by combining D5 RIN and a cellulosic waiver credit (CWC)
- CWC is “activated” in any year during which EPA reduces the RVO for cellulosic ethanol (D3 bucket)
- $D5 + CWC = D3$
- CWC is reported annually by EPA: the value is whichever is greater, 25c or $\$3 - P$, where P is the 12-month average of wholesale gasoline prices.
- **11.72 RINs = 1 MMBtu of biogas**



ICForecast: RIN Pricing Outlook

- D3 RIN pricing calculated as sum of D5 and CWC
- D5 RIN values calculated based on lowest cost economics of advanced biofuel production and forward markets for commodities.
- Sensitivities: availability of blending tax credit; pricing in other RIN buckets (e.g., D6)

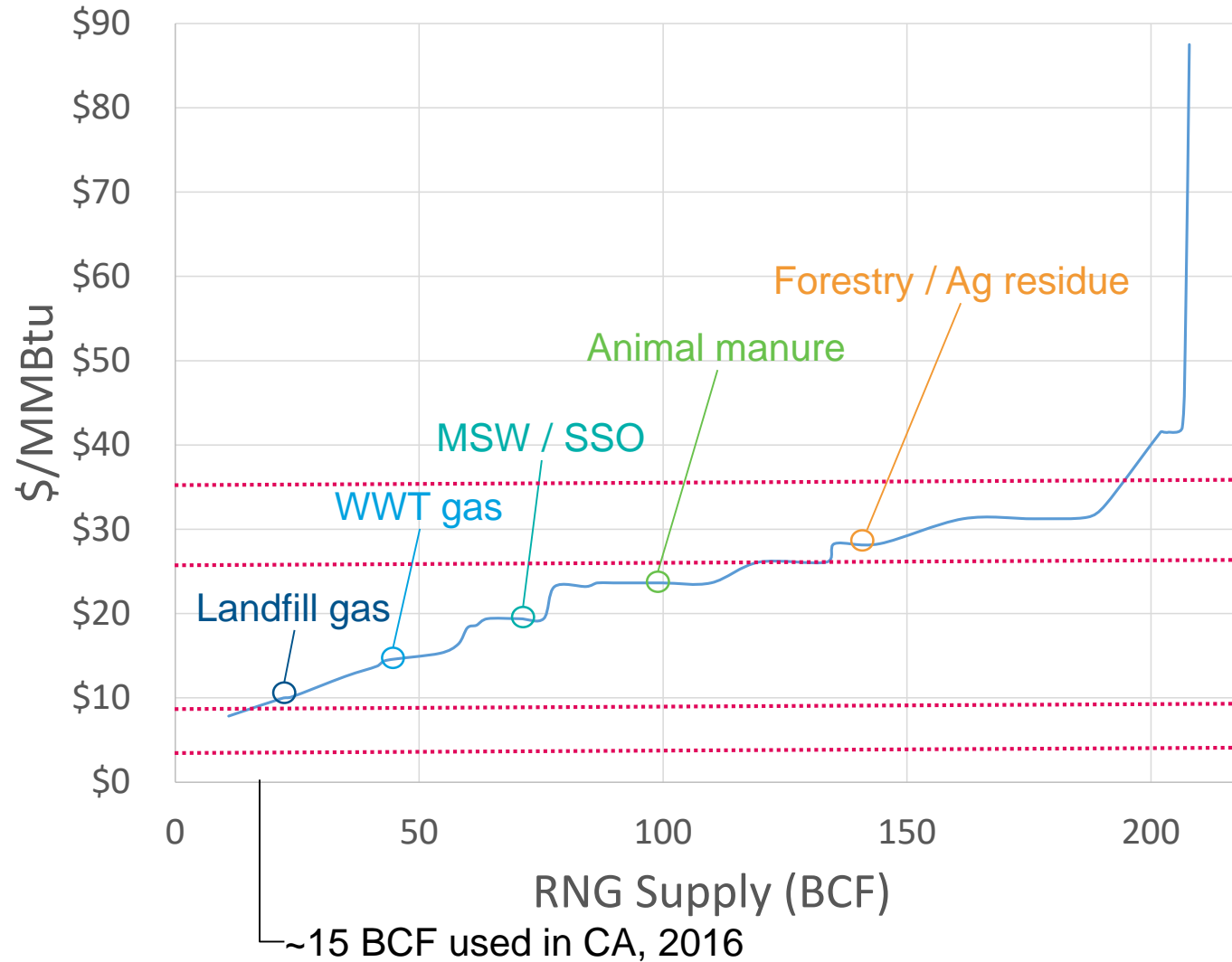


RFS Outlook for RNG

Disclaimer: Views are mine alone

- RNG is delivering D3 RINs where cellulosic ethanol has struggled. Delivers a nice “win” to EPA as part of the program.
- Strong network of support across trade groups (e.g., Coalition for Renewable Natural Gas).
- The RFS program is likely to undergo some changes over the next 24—36 months; however, the success of biogas in the market is likely to protect its “share”.
- Investment in other states suggests that developers are increasingly willing to take the risk, despite some uncertainty in EPA RFS market. Interestingly, the LCFS is a significant hedge for dairy digester investors. Keep in mind: RIN pricing carries the day for landfill gas projects, and LCFS offers additional value. For dairy digester projects, however, the low CI value in the LCFS market is on par with RINs (depends on CI).

Outlook for RNG



- Landfill gas, 9, 20+ facilities
- WWT gas, 4, 4-6 facilities
- MSW/SSO, 7, 7-10 facilities
- Animal Manure, 8, 8 facilities
- Forest/Ag Residue, 0, 0 facilities

- RINs, \$3/D3
- LCFS, \$80/t, -250 g/MJ
- LCFS, \$80/t, -30 g/MJ
- LCFS, \$80/t, 35 g/MJ



Thank you

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About ICF

- Our team has worked with 25—30 clients across multiple RNG projects over last 24—36 months



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