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The EPA's Renewable Fuel Standard Rulemaking for 2018 —Still a Push

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The U.S. Environmental Protection Agency (EPA) announced the proposed rulemaking for the Renewable Fuels Standard (RFS) for 2018 and the biomass-based diesel volume requirement for 2019 on July 5th. In this article, we analyze the expected outcome of implementing the newly announced mandates. These standards were generally as expected, with exception of the total advanced biofuels mandate which was a bit smaller than anticipated. The focus of the present analysis, then, is on the magnitude of the "push" in production and consumption of biofuels above the E10 blend wall implied by the requirements (mandates) of the RFS and the implications for production and consumption of biomass-based diesel. The analysis follows a similar format of our previous analysis of earlier EPA rulemakings, most recently in the *farmdoc daily* articles of May 26, 2016, June 2, 2016 , and November 30, 2016.

Background

The statute for the Renewable Fuels Standards (RFS) required the U.S. Environmental Protection Agency (EPA) to establish volume requirements for four categories of biofuels for each year from 2008 through 2022: cellulosic biofuel, biomass-based diesel, total advanced biofuel (which includes biomass-based diesel), and renewable fuel (referred to as conventional ethanol here). The difference between the total advanced mandate and the total of the cellulosic and biodiesel mandate is referred to as the undifferentiated advanced mandate and can be satisfied by a combination of qualified advanced biofuels. Conventional biofuels is generally assumed to be corn-based ethanol but this is actually not explicitly required by the RFS legislation. Instead, corn-based ethanol has been the cheapest alternative for this category that also meets the environmental requirements of the RFS. In addition, the conventional portion of the mandate can also be satisfied with discretionary blending of advanced biofuels, so one can refer to the conventional mandate as an implied mandate. We refer to this implied mandate as the conventional ethanol mandate in order to be consistent with the most common term for this particular RFS mandate. Cellulosic biofuels have been in very limited supply, so the EPA has written down the cellulosic mandate to very low levels relative to statutory levels each year. The total advanced biofuel mandate has also been written down in conjunction with the write down in the cellulosic mandate. The biodiesel mandate was established as a minimum of one billion gallons per year from 2012 through 2022, with larger amounts subject to EPA approval.

Table 1 summarizes the statutory RFS volume requirements for the 2014 through 2018 calendar years, as well as the mandates contained in final EPA rulemaking for the 2014 through 2017 calendar years and the proposed rulemaking for 2018. For 2018, the renewable fuel volume requirement is established at 19.24 billion gallons, compared to the 2017 standard of 19.28 billion gallons and the statutory requirement of 26 billion gallons. The biomass-based diesel mandate is increased by 100 million gallons for 2018 to 2.1 billion gallons (as established in the final rulemaking for 2017 released in November 2016) and is held constant for 2019. The cellulosic biofuels and total advanced biofuels requirements are slightly smaller than the requirements for 2017 and well below the statutory requirements. The conventional ethanol requirement for 2018 is 15.0 billion gallons, equal to both the 2017 requirement and the statutory requirement.

Table 1. RFS Volume Requirements for the U.S., 2014-2019

	RFS Statutory					EPA 2014-2017 Final Rulemaking				EPA Proposed 2018 Rulemaking	
Category	**2014**	**2015**	**2016**	**2017**	**2018**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Cellulosic Biofuel	1.75	3.00	4.25	5.50	7.00	0.033	0.123	0.230	0.311	0.238	NA
Biomass-Based Diesel	>1	>1	>1	>1	>1	1.63	1.73	1.90	2.00	2.10	2.10
Advanced Biofuel	3.75	5.50	7.25	9.00	11.00	2.67	2.88	3.61	4.28	4.24	NA
Total	18.15	20.50	22.25	24.00	26.00	16.28	16.93	18.11	19.28	19.24	NA
Implied Conventional	14.40	15.00	15.00	15.00	15.00	13.61	14.05	14.50	15.00	15.00	NA

Notes: These volumes are stated in billion gallons of ethanol equivalents, except for biomass-based diesel which is stated in billion gallons of "wet" physical volume terms. NA stands for not applicable.

The advanced mandate proposed for 2018 was smaller than expected and a disappointment to biofuel proponents. The reason for this disappointment can be seen by comparing the level of the advanced mandate relative to the minimum level given by the undifferentiated advanced mandate. For 2017, the minimum advanced standard is 3.5 billion gallons and the final standard is 4.28 billion gallons, a differenced of 728 million gallons. For 2018, the minimum advanced standard is 4.0 billion gallons and the final standard is 4.24 billion gallons, a differenced of only 240 million gallons. If the difference for 2017 had been maintained in 2018 the advanced mandate would have been proposed at 4.728 billion gallons instead of 4.24 billion gallons.

Analysis

We start the analysis of the EPA proposed rulemaking with a computation of the magnitude of the "push" above the E10 blend wall in the production and consumption of conventional ethanol for each year from 2014 through 2018. The magnitude of the push is calculated as the gap (difference) between the EPA mandate as implemented and the actual or expected consumption of conventional ethanol. Those calculations are presented in Table 2. To understand the calculations, it is necessary to recognize that the mandate is not enforced as a strictly volumetric mandate, but instead is enforced as a fractional mandate. The EPA establishes the blend, or fractional, rate based on the volumetric mandate and a projection of petroleum-based gasoline and diesel consumption. Obligated parties, then, meet their obligations by blending at that established rate regardless of whether total gasoline and diesel consumption is more or less than the EPA projection. As a result, the magnitude of the final volumetric mandate is dependent on the actual magnitude of gasoline and diesel consumption.

Since RFS compliance is completed for 2014-2016, total gasoline and diesel consumption and conventional ethanol volumes for these years are available as actual volumes rather than estimates. These data from the EPA EMTS system are found here. It turns out that the actual conventional ethanol mandate for 2015 and 2016 was slightly larger than the volumetric mandate established in the final rulemaking for those years due to the fractional implementation of the mandate and total petroleum and diesel fuel use that exceeded projections. Estimates of total ethanol use, cellulosic ethanol use, other advanced ethanol use, and the resulting estimate of conventional ethanol use final EPA EMTS data or

EIA estimates. The difference between the conventional ethanol mandate and conventional ethanol use is referred to as the conventional ethanol gap and represents the potential push in ethanol consumption above the E10 blend wall implied by the mandate. The push ranged from 260 to 457 million gallons for those three years. The gap was filled by a combination of drawing down the existing stock of Renewable Identification Numbers (RINs), expansion in the use of higher ethanol blends (E15 and E85), and/or increasing the use of non-ethanol biofuels such as biodiesel and renewable diesel.

Table 2. Conventional Ethanol Mandate Gap under EPA Final RFS Rulemaking for 2014-2017 and Proposed Rulemaking for 2018

	EPA Rulemakings				
	Final				Proposed
Item	2014	2015	2016	2017	2018
(1) Petroleum Gasoline and Diesel Use	177.043	180.527	180.184	181.521	183.740
(2) Fractional Ethanol Mandate	7.68%	7.90%	8.09%	8.32%	8.16%
(3) Conventional Ethanol Mandate [(1)*(2)]	13.597	14.262	14.577	15.103	15.000
(4) Total Ethanol Use [(5)+(6)+(7)]	13.421	13.922	14.382	14.419	14.457
(5) Cellulosic Ethanol Use	0.001	0.002	0.004	0.004	0.017
(6) Other Advanced Ethanol Use	0.090	0.115	0.061	0.050	0.080
(7) Conventional Ethanol Use	13.330	13.805	14.317	14.365	14.360
(8) Conventional Ethanol Mandate Gap [(3)-(7) if >0]	0.266	0.457	0.260	0.738	0.640

Notes: All values stated in terms of billion gallons except (2), which is in percentage terms. Total petroleum gasoline and diesel use (1) is net of renewable fuel use (ethanol and biomass-based diesel) and the small refinery exemption. The small refinery exemption is set to zero for 2015-2018. Petroluem gasoline and diesel use (1) and the conventional ethanol mandate (3) for 2014-2016 are based on actual compliance reported in the EPA EMTS system. Petroluem gasoline and diesel use (1) for 2017-2018 is based on EIA estimates from the July 2017 STEO. Conventional ethanol mandates (3) for 2017-2018 are estimated using the fractional ethanol mandates (2) reported in the final EPA RFS rulemaking for 2017 and proposed rulemaking for 2018.

The estimates for 2017 in Table 2 require further explanation. We utilize the projection of calendar year petroleum gasoline and diesel use found in the July 2017 EIA Short term Energy Outlook (STEO) report, whereas the final 2017 rulemaking uses the October 2016 STEO. In addition, we do not make an adjustment for diesel fuel use for ocean-going vessels as the EPA does in all prior RFS rulemakings. This adjustment has been about 2.1 billion gallons in recent years. The reason we do not replicate this part of the EPA projections is that available data on final obligated gasoline and diesel volumes for 2014-2016 exceed that estimated by the EPA by approximately the estimate of ocean-going diesel use. It appears that obligated parties do not segregate out these volumes when reporting total obligated volumes even though they are technically not subject to RFS standards.

Given our estimate of petroleum gasoline and diesel use for 2017, we apply the fractional ethanol mandate established in the final 2017 rulemaking to estimate the convention ethanol mandate. This procedure results in an estimated 2017 conventional ethanol mandate of 15.103 billion gallons, compared to the final volumetric mandate of 15 billion gallons. Again, the estimated mandate is higher because the fractional mandate is fixed and petroleum gasoline and diesel use for 2017 is now projected at a higher level than when the final rulemaking was released. The EIA estimates that 14.419 billion gallons of ethanol will actually be used in 2017, and therefore, conventional ethanol use will reach 14.365 billion gallons. That leaves a conventional mandate gap of 738 million gallons that must be filled by a drawdown in RINs stocks, expansion of higher ethanol blends, and/or increased use of non-ethanol biofuels.

For 2018, the EPA's proposed rulemaking includes an implied conventional ethanol mandate of 15 billion gallons and the EIA July 2017 STEO projects 2018 petroleum gasoline and diesel use (including use for ocean-going vessels) at 183.739 billion gallons. Those estimates imply a fractional ethanol mandate of 8.16 percent (15/183.739). Total ethanol use is projected at 14.457 billion gallons, slightly higher than the EPA projection due to the updated STEO estimates of petroleum fuel consumption. We project cellulosic ethanol consumption at 17 million gallons, about the mid-point of the EPA's projected range. Other advanced ethanol use is projected at 80 million gallons which includes 50 million gallons of imported

Brazilian ethanol. The EPA is using a projection of 100 million gallons of imports. Conventional ethanol use is projected at 14.36 billion gallons, leaving an estimated conventional ethanol mandate gap of 640 million gallons for 2018. Note that if the projection of petroleum gasoline and diesel use in 2017 had not risen the estimated conventional mandate gap would have been almost exactly the same in 2017 as 2018.

The calculations for estimating the advanced biofuels gaps from implementing the RFS mandates for 2014-2018 are shown in Table 3. The calculations follow the same methodology and data sources as used in Table 2. The calculation of the advanced gap for each year starts with the total advanced biofuels mandate as implemented for 2014-2016, estimated for 2017 based on the final rulemaking and July 2017 STEO projections, and proposed for 2018 based on the proposed rulemaking and July 2017 STEO projections. The advanced mandate gap is then calculated as the advanced mandate minus the cellulosic mandate, minus the biomass-based diesel mandate (multiplied by 1.54 in 2014 and 1.53 in all other years to convert wet gallons to ethanol equivalents), minus the actual/projected use of undifferentiated ethanol (Brazilian and domestic), minus the actual/projected use of undifferentiated non-ethanol biofuels. The actual advanced gap was zero for both 2014 and 2015, is projected at 900 million gallons for 2017, and 684 million gallons for 2018.

Table 3. Advanced Mandate Gap under EPA Final Rulemakings for 2014-2017 and Proposed Rulemaking for 2018

	EPA Rulemakings				
	Final				Proposed
Item	2014	2015	2016	2017	2018
(1) Petroleum Gasoline and Diesel Use	177.043	180.527	180.184	181.521	183.740
(2) Fractional Advanced Mandate	1.51%	1.62%	2.01%	2.38%	2.31%
(3) Advanced Mandate [(1)*(2)]	2.673	2.925	3.622	4.320	4.240
(4) Fractional Cellulosic Mandate	0.019%	0.069%	0.128%	0.173%	0.130%
(5) Cellulosic Mandate [(1)*(4)]	0.034	0.125	0.231	0.314	0.238
(6) Fractional Biomass-Based Diesel Mandate	1.41%	1.49%	1.59%	1.67%	1.71%
(7) Biomass-Based Diesel Mandate [(1)*(6)]	1.621	1.758	1.873	1.981	2.100
(8) Undifferentiated Brazilian Ethanol	0.064	0.089	0.034	0.020	0.050
(9) Undifferentiated Domestic Ethanol	0.026	0.026	0.027	0.030	0.030
(10) Undifferentiated Non-Ethanol	0.053	0.033	0.027	0.025	0.025
(11) Advanced Mandate Gap [(3)-(5)-(7)*CF-(8)-(9)-(10) if >0]	0.000	0.000	0.438	0.900	0.684

Notes: All values stated in terms of billion gallons of ethanol-equivalents except fractional mandates (2), (4), and (6), which are in percentage terms, and the biomass-based diesel mandate, which is stated in billion gallons of "wet" physical volume. Total petroleum gasoline and diesel use (1) is net of renewable fuel use (ethanol and biomass-based diesel) and the small refinery exemption. The small refinery exemption is set to zero for 2015-2018. Petroluem gasoline and diesel use (1), the advanced mandate (3), cellulosic mandate (5), and biomass-based diesel mandate (7) for 2014-2016 are based on actual compliance reported in the EPA EMTS system. Petroluem gasoline and diesel use (1) for 2017-2018 is based on EIA estimates from the July 2017 STEO. Advanced (3), cellulosic (5), and biomass-based diesel (7) for 2017-2018 are estimated using the fractional advanced (2), cellulosic (4), and biomass-based diesel (6) reported in the final EPA RFS rulemaking for 2017 and proposed rulemaking for 2018.

Like the conventional gaps, the advanced mandate gaps have to be met with some combination of additional production and consumption of advanced biofuels and the use of the existing stock of RINs. Since biomass-based diesel has been the “marginal gallon” for filling both the advanced and conventional mandate gaps in recent years, we calculate total biomass-based diesel production and consumption requirements for each year in Table 4. That total is assumed to include the total RFS gap (conventional plus advanced) divided by 1.54 in 2014 and 1.53 in other years, plus the biomass-based diesel mandate.

The RFS gap is divided by 1.54/1.53 since the gap in Table 4 is calculated as ethanol equivalents. Implied total biomass-based diesel consumption, then, is calculated in terms of wet gallons. The use of biomass-based diesel to meet the biomass-based diesel mandate and as the sole source to meet the RFS mandate gaps approaches 3.1 billion gallons in 2017 and remains near 3.0 billion gallons in 2018. The decline in implied total biomass-based diesel use from 2017 to 2018 is moderated by the increase in the biomass-based diesel mandate from an estimated 1.981 to 2.1 billion gallons.

Table 4. Conventional Ethanol, Advanced, and Total RFS Mandate Gaps under EPA Final Rulemakings for 2014-2017 and Proposed Rulemaking for 2018

	EPA Rulemakings				
	Final				Proposed
Item	2014	2015	2016	2017	2018
(1) Conventional Ethanol Mandate Gap	0.266	0.457	0.260	0.738	0.640
(2) Advanced Mandate Gap	0.000	0.000	0.438	0.900	0.684
(3) Total RFS Gap [(1)+(2)]	0.267	0.457	0.698	1.637	1.324
(4) Biomass-Based Diesel Mandate	1.621	1.758	1.873	1.981	2.100
(5) Implied Total Biomass-Based Diesel [(3)/CF+(4)]	1.794	2.057	2.329	3.052	2.965

Notes: These volumes are all stated in billion gallons of ethanol equivalents, except for (4) biomass-based diesel and (5) implied total biodiesel, which are stated in billion gallons of "wet" physical volume terms. The conversion factor for biodiesel equals the weighted-average D4 conversion factor in each year. It is 1.54 in 2014 and 1.53 in all other years.

Implications

We analyzed the magnitude of the "push" in production and consumption of biofuels implied by the proposed rulemaking for the Renewable Fuels Standard (RFS) for 2018 released last week. We find that the proposed standard for 2018 implies a measurable push in the consumption of conventional ethanol since the mandate exceeds expected domestic consumption. The magnitude of that gap is estimated at 640 million gallons for 2018, compared to the estimate for a record large gap in 2017 of 738 million gallons. The gap ranged from 260 to 457 million gallons in 2014-2016. The advanced biofuels mandate is estimated at 684 million gallons in 2018, compared to the estimate of 900 million gallons in 2017 and the actual gap of 438 million gallons in 2016. Our analysis of the proposed rulemaking for 2018 implies:

(1) The EPA under the new Administration is "staying the course" on the implied conventional ethanol mandate with that mandate at the statutory level of 15 billion gallons. If that policy continues and the rate of increase in domestic gasoline consumption does not accelerate more rapidly, there will continue to be a notable conventional ethanol gap beyond 2018.

(2) The push in advance biofuels production and consumption remains large, but is smaller than in 2017 as both the total biofuels mandate dropped and the mandate for undifferentiated advanced biofuels declined marginally. However, the minimum undifferentiated mandate will increase by statute in 2019 to 4.5 billion gallons. So, even though the biodiesel mandate is proposed to stay constant at 2.1 billion gallons for 2019, the total advanced mandate gap could jump another 260 million gallons (4.5 -4.24 billion gallons).

(3) The relatively large conventional ethanol gap implied for 2017 and 2018 suggests that the current discount in the price of D6 (ethanol) RINs relative to D4 (biomass-based diesel) RINs will continue to narrow towards equality (e.g., *farmdoc daily*, December 4, 2015).

(4) Biomass-based diesel is likely to remain the "marginal gallon" for filling both the conventional and advanced mandate gaps. This means relatively large levels of biodiesel production will continue to be required which in turn will require large levels of fats and oils feedstock.

We will re-examine the implications of large levels of biodiesel production for world vegetable oil markets in an upcoming article.

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