The Myth of High RIN Prices As Proof of the Blend Wall

- **Data recently released by EPA challenges conventional wisdom that the blend wall caused RIN prices to rise in 2013.**
- **Refiners and importers blended ethanol into obligated gasoline volumes beyond the 10 percent limit as early as 2010.**
- **Refiners' and importers' use of compliance flexibility reveals they did not experience RIN shortages at any point.**
- **EPA's rulemaking delays and unwarranted changes to the RFS based on blend wall assumptions harmed biofuel producers while providing obligated parties relief from a problem that didn't exist.**
- **EPA should reconsider its 2017 RFS proposed rule in light of this newly available data.**

In 2007, Congress updated the Renewable Fuel Standard (RFS) and set a statutory schedule for annual increases in production and use of biofuels to reach 36 billion gallons in 2022. Under the RFS, petroleum refiners and importers are assigned an annual Renewable Volume Obligation (RVO), indicating the percentage of refined or imported fuel that must be renewable in order to meet the congressionally set schedule for production and use of biofuels. Entities incurring an RVO are referred to as obligated parties. Renewable Identification Numbers (RINs) are credits generated under the RFS program that obligated parties use to demonstrate compliance with their annual RVOs.

The blend wall is a theoretical 10 percent limit on the amount of ethanol that can be blended into gasoline in the United States, due to infrastructure and market constraints. The 36 billion gallon volume set by Congress was projected to be 20 percent of transportation fuel use by 2022, indicating that the blend wall would have to be passed at some point. It has become widely accepted that U.S. fuel

refiners and importers reached the 10 percent blend wall in 2013 and that this event was signaled by a dramatic spike in spot market prices for RINs.[1,2]

A seminal 2012 paper from researchers at the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri advanced the theory that a sharp increase in RIN prices would signal when the RFS forced fuel refiners over the blend wall.[3] The authors sought to understand why RIN prices did not rise during 2012, given estimated constraints on biofuel supplies in comparison to RFS requirements. The researchers tested a hypothesis that obligated parties could accumulate sufficient RINs in the early years of the updated RFS to delay arrival of the blend wall (though not prevent it), possibly until 2015. The paper presented a straightforward accounting model comparing the congressionally established fuel volumes to the number of available RINs, estimating an existing bank of 3 billion RINs at the start of 2012.

Data recently released by the U.S. Environmental Protection Agency (EPA) in response to a Freedom of Information Act (FOIA) request enables a true accounting of how obligated parties met annual RVOs from 2010 through 2013, using current year generated RINs, banked carryover RINs, and other compliance options.[4,5] A true accounting – comparable to the FAPRI model – directly challenges the conventional wisdom that difficulty in meeting the RFS obligations due to the blend wall caused RIN prices to rise in 2013. RFS obligated parties' reported fuel use and

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[1] Stock, J.H. (2015) "The Renewable Fuel Standard: A Path Forward." New York: Columbia University School of International and Public Affairs and Center on Global Energy Policy.
[2] Knittel, C.R. et al. (2015) "The Pass-Through of RIN Prices to Wholesale and Retail Fuels under the Renewable Fuel Standard." Cambridge, MA: Center for Energy and Environmental Policy Research, Massachusetts Institute of Technology.
[3] Thompson, W. et al. (2012) "A Question Worth Billions: Why Isn't the Conventional RIN Price Higher?" Columbia, MO: Food and Agricultural Policy Research Institute. FAPRI-MU Report #12-12.
[4] EPA. (2016) "Annual Compliance Data for Obligated Parties and Renewable Fuel Exporters under the Renewable Fuel Standard (RFS) Program." https://www.epa.gov/fuels-registration-reporting-and-compliance-help/annual-compliance-data-obligated-parties-and.
[5] Letter from Byron J. Bunker, Director, Compliance Division, Office of Transportation and Air Quality, USEPA to Paul Winters, BIO. "RE: Freedom of Information Act request EPA-HQ-2015-004861." Aug. 8, 2016. https://foiaonline.regulations.gov/foia/action/public/view/request?objectId=090004d2805fef3f.

use of ethanol RINs indicates that the blend wall was reached as early as 2010 and was definitely breached by 2012. Nonetheless, during those years conventional RIN prices remained low and obligated parties continued to accumulate excess RINs to carry over for future compliance years.

The 2013 price spikes in spot market RIN trading cannot be explained as a consequence of the blend wall, since they are not connected to a demonstrable increase in difficulty for obligated parties to meet annual RFS obligations. The finding has implications for current policy in EPA's administration of the RFS. Further research into the causes of RIN price spikes will require data on the volumes of RINs traded and actual prices paid during transfers of RINs.

Compliance Options

Obligated parties are assigned four distinct but nested RVOs each year – for cellulosic biofuel, biomass-based diesel (BBD), advanced biofuel and conventional biofuel – and they must retire sufficient eligible and valid RINs to satisfy each. RVOs are nested; e.g., RINs retired to meet the cellulosic or the BBD RVO also concurrently satisfy the advanced and overall RVO. EPA established different RIN codes to distinguish the various categories of biofuels eligible to meet the nested RVOs. With the exception of D4 RINs, though, the RIN codes do not distinguish the type of biofuel, such as ethanol or biomass-based diesel; EPA publishes separate data on RINs generated by type of fuel produced.

In establishing regulations for the RFS program, EPA provided obligated parties flexibility in complying with annual RVOs. EPA established the RIN system under the RFS to provide credits, as directed by Congress, for refiners and importers who use more renewable fuel than required. Like other compliance systems under the Clean Air Act fuel regulations, RFS RINs also equalize the compliance burden among obligated parties. Equalization of the compliance burden enables obligated parties who exceed their individual requirement to transfer (or sell) credits to those who fall short of the obligation.

Per the statute, RINs are valid to meet annual RVOs for one year from the date they are generated. EPA's regulations enable individual obligated parties to meet up to 20 percent of an annual RVO using RINs generated in the preceding year. Such RINs are referred to as "carryover RINs." RINs that are not used to satisfy an RVO in the year they are generated or the subsequent year expire unused.

EPA regulations, as directed by Congress, also allow individual obligated parties to carry forward a deficit in an annual RVO, essentially deferring all or part of that RVO to the following year. This is referred to as the "deficit carryforward" provision. The statute and regulations specify, though, that the individual obligated party must satisfy the full deficit in the subsequent year along with the annual RVO. An individual obligated party may not have a deficit carryforward in the same RVO two years in a row.

The FAPRI paper was published in December 2012, prior to the compliance deadline for the 2012 RFS RVOs (which occurred February 28, 2013). Consequently, the authors make use of data provided by EPA on the number of RINs generated in prior years – excluding the 2010 compliance year – to estimate the availability of 2011 RINs to be used for the current year and carried over for 2012. Lacking data on the use of carryforward deficits or RINs expired unused, the authors do not include these data points in the calculation. The authors also use the volumes specified by Congress for the RFS as proxies for the annual RVOs; they then estimate the obligation to use ethanol by calculating the "conventional gap" and the "advanced gap" – the difference between the RFS statutory volumes for these categories and the BBD category. Lastly, the authors use fuel use data from the Energy Information Administration (EIA) to estimate whether the annual RVOs approach the blend wall.

Actual data from the program now provides a clearer picture of the relative difficulty or ease for obligated parties to meet annual RVOs between 2010 and 2013. The data includes numbers of RINs used for compliance, carried over, and expired unused as well as actual RVOs (which differ from the statutory volumes). Data on the use of carryforward deficits – which decrease the current year and increase the subsequent year RVOs – can be included in a true accounting.

The Devil's in the Data

The volumes of U.S. fuel subject to the RFS (as reported by obligated parties) are substantially smaller than fuel use reported by EIA. Small refiners and small refineries (even those owned by large refiners) were exempted from the RFS program through 2012. In setting the 2010 RVOs, EPA reduced EIA's estimate of U.S. fuel production by 13.5 percent, while providing small refineries (processing less than 75,000 barrels of crude per day) and small refiners (employing 1,500 or fewer people) exemption from the obligations.[6,7] In 2011, EPA ended the exemption for small refiners, but granted hardship exemptions to three small refineries that petitioned the agency.[8] Then in 2012, in response to a Department of Energy study ordered by Congress, EPA reinstated the exemption for 21 small U.S. refineries and retroactively applied it to the 2011 RVOs, prior to compliance deadlines. EPA adjusted the EIA estimates of fuel use for those years by approximately 3.6 percent of the gasoline pool and 4.5 percent of the diesel pool, estimating the reduction to be approximately 4.87 billion gallons of gasoline and 2.28 billion gallons of diesel in 2012.[9] EPA granted a single exemption to a small refinery in 2013.[10]

The actual fuel volumes reported by obligated parties are shown below in Table 1. Both gasoline and diesel are obligated fuels under the RFS, but ethanol is not blended into diesel fuel. The volume of obligated gasoline use is approximately 70 percent of the reported volumes each year. EIA reports minor variations in the balance of gasoline and diesel volume used each year from 2010 to 2013, so these relative annual percentages are applied to the reported obligated volumes to estimate obligated gasoline volume. The blend wall is estimated as 10 percent of annual obligated gasoline volumes.

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[6] Fed. Reg. 72 (23911), Tuesday, May 1, 2007.
[7] 75 Fed. Reg. (14735-14737), Friday, March 26, 2010.
[8] 75 Fed. Reg. (76805), Thursday, December 9, 2010.
[9] 77 Fed. Reg. (1223, 1340), Monday, January 9, 2012. Cf. "Small Refinery Exemption Study: An Investigation into Disproportionate Economic Hardship," U.S. Department of Energy, March 2011.
[10] 78 Fed. Reg. (49825), Thursday, August 15, 2013.

Table 1: Blend Wall for RFS Renewable Volume Obligations, 2010-2013

	2010	2011	2012	2013
Obligated fuel volume	153,191,431,635	169,401,578,093	166,585,474,309	172,975,631,165
Gasoline percentage of obligated fuel	0.71	0.69	0.7	0.7
Estimated obligated gasoline volume	108,168,815,169	117,707,460,175	116,507,319,837	121,546,237,671
Estimated blend wall	10,816,881,517	11,770,746,017	11,650,731,984	12,154,623,767

Annual RVOs are calculated as both a percentage of the current year's obligated volumes plus any deficit carryforward from prior years. Obligated parties used the deficit carryforward provision most heavily in 2010. They carried forward approximately 13.5 percent of the 2010 BBD RVO and 24.6 percent of the advanced RVO as a deficit and added these volumes to the 2011 RVO. By comparison, they carried forward less than 1.3 percent of the 2010 overall RVO as a deficit. Obligated parties have used the deficit carryforward provision less and less each year since, indicating relative ease in meeting the annual RVOs. In 2011, they carried forward only about 3.4 percent of the BBD RVO and added that volume to the 2012 RVO. They carried forward less than 2.7 percent of the advanced RVO and less than 0.5 percent of the overall RVO. Since 2011, obligated parties have carried forward less than 1 percent of each annual RVO as a deficit.

The total annual RVOs are shown below in Table 2. The final RVOs below are calculated by subtracting the deficit from the current year and adding it to the following year. Note that the statute adopted by Congress included 2009 obligations for biomass-based diesel and advanced volumes; however, EPA did not finalize regulations until 2010. EPA therefore set a BBD RVO in 2010 that included the 2009 obligation. Cellulosic RVOs for 2011 and 2012 were vacated, so the cellulosic RVO for 2011 remains zero, despite the deficit carryforward.

The FAPRI paper calculates the obligation to use ethanol as the "gap" between the overall RVO and the BBD RVO. Absent the data recently released by EPA, this was a

reasonable approximation. Nearly all D6 RINs and a large majority of D5 RINs represent ethanol production, which must be incorporated in the gasoline supply. A more accurate approximation can be obtained by looking at EPA data on the annual generation of RINs by type of biofuel produced.[11] This data shows that not all D6 RINs represent ethanol; in 2013, nearly 2 percent of D6 RINs were assigned to biomass-based diesel or other fuels. And not all D5 RINs represent ethanol; in 2010, nearly 86 percent of D5 RINs generated were for biomass-based diesel.

Table 2: Calculation of Annual RVOs Considering Deficit Carryforwards

	2010	2011	2012	2013
Annual overall RVO	12,638,293,110	13,569,066,405	15,375,839,279	16,848,743,020
Annual advanced RVO	934,467,733	1,321,332,309	2,015,684,239	2,802,157,305
Annual BBD RVO	1,685,124,090	1,168,882,005	1,515,927,816	1,954,598,102
Annual cellulosic RVO	6,182,591			864,865
Overall deficit carryforward	163,353,609	66,194,174	72,956,555	57,634,008
Advanced deficit carryforward	229,693,190	35,104,504	18,582,711	17,290,622
BBD deficit carryforward	227,120,812	39,731,828	13,336,991	6,617,884
Cellulosic deficit carryforward	31,453			26
Final overall RVO	12,474,939,501	13,666,225,840	15,369,076,898	16,864,065,567
Final advanced RVO	704,774,543	1,515,920,995	2,032,206,032	2,803,449,394
Final BBD RVO	1,458,003,278	1,356,270,989	1,542,322,653	1,961,317,209
Final cellulosic RVO	6,151,138			864,839
Percent ethanol in advanced RVO	14.1	85.3	96.7	86.7
"Ethanol gap"	11,106,281,004	12,041,123,331	13,757,942,313	14,212,739,835
Percent of obligated gasoline	10.3	10.2	11.8	11.7

[11] U.S. EPA. (2016) Renewable Identification Number (RIN) Data for Renewable Fuel Standard Program. https://www.epa.gov/renewable-fuel-standard-program/renewable-identification-number-rin-data-renewable-fuel-standard.

The amount of the annual RVOs that had to be met with ethanol – the "ethanol gap" – is estimated in Table 2 above by subtracting the BBD RVO plus the portion of the advanced RVO met by available biomass-based diesel from the overall RVO.

The amount of ethanol that obligated parties were therefore required to blend into the gasoline they produced was already at 10 percent (or slightly above) as of 2010. Comparing the "ethanol gap" in Table 2 above to the estimated blend wall in Table 1 above illustrates the fact that annual RVOs were above the blend wall by 2010. By 2012, the requirement was at 11.8 percent. Further, the "ethanol gap" was no more difficult for obligated parties to meet in 2013 than in 2012 – the relative percentages are nearly identical. The data undermine the theory that the blend wall was the cause of RIN price spikes in 2013.

Did Obligated Parties "Delay" the Blend Wall?

The FAPRI researchers test the hypothesis that obligated parties could use carryover RINs to limit blending of ethanol in any current year and thereby delay the arrival of the blend wall. Under this hypothesis, obligated parties would use as many carryover RINs as possible to meet each annual RVO, up to the allowable 20 percent.

The data recently released by EPA demonstrate that obligated refiners and importers did not use the maximum allowable number of carryover RINs in any year for any RVO, with the singular exception of the overall RVO in 2012. In fact, the number of RINs obligated parties allowed to expire unused in 2010 and 2011 is considerable in comparison to the numbers carried over. Moreover, use of carryover RINs declined as a percentage of the annual RVOs from 2012 to 2013.

Table 3 below presents the numbers of 2010, 2011, and 2012 RINs carried over and retired to meet the 2011, 2012 and 2013 RVOs. The percentage of the annual RVOs that obligated refiners and importers met with carryover RINs and the numbers of prior year RINs that expired unused, after the annual RVO was met, are also presented.

Because the reported 2010 BBD RVO also included 2009 volumes, obligated parties had a limited number of 2010 D4 and D5 RINs available to carry over for the 2011 BBD and advanced RVOs. Obligated parties met less than 5 percent of the 2011 BBD and advanced RVOs with carryover 2010 RINs. Comparatively, they met 17 percent of the overall 2011 RVO with carryover 2010 RINs. Obligated refiners and importers apparently met a small portion of the 2011 RVOs with 2010 RFS1 RINs that are not reported by EPA.

In 2012, obligated parties met 18 percent of the BBD RVO and 16.1 percent of the advanced RVO with carryover RINs. In 2013, obligated parties met less than 15 percent of their annual RVOs with carryover RINs.

Nearly a half billion available 2010 vintage RINs expired unused, even as the deficit carryforward provision was used. And nearly half a billion 2011 vintage RINs also expired unused. Most of the expired unused RINs were D6 RINs from ethanol – more than 6 percent of D6 RINs generated in 2010 and nearly 3.5 percent of D6 RINs generated in 2011 expired unused.

Table 3: Carryover RINs Retired by Obligated Refiners and Importers, 2011-2013

	2011	2012	2013
D6 RINs carried over	2,241,455,041	3,169,954,134	2,087,485,067
D5 RINs carried over	3,580,101	50,801,949	165,030,837
D4 RINs carried over	57,368,904	277,937,240	248,305,050
Percent of overall RVO met with carryover RINs.	16.9	22.8	14.8
Percent of advanced RVO met with carryover RINs	4	16.2	14.7
Percent of BBD RVO met with carryover RINs	4.2	18	12.7
Prior year D6 RINs expired unused	426,649,448	469,306,771	11,935,021
Prior year D5 RINs expired unused	56,433	2,688,287	1,407,742
Prior year D4 RINs expired unused	2,755,307	23,115,151	2,514,278

Obligated parties did not use carryover RINs to the maximum possible, except in one instance. Interestingly, the data reveals that obligated parties met 22.8 percent of the 2012 overall RVO with rollover RINs, as shown in Table 3 above. While there is a 20 percent cap on use of rollover RINs, the cap applies to individual obligated parties. The data here represents an aggregate use of RINs. There is no indication from EPA that any individual refiner violated the cap.

The aggregate use of carryover RINs beyond the 20 percent cap is clearly indicated in the data posted by EPA for obligated refiners, recreated in Table 4 below. Obligated refiners used more than 3.378 billion 2011 vintage RINs out of a total 15.139 billion RINs retired to meet their overall 2012 RVO, equal to 22.3 percent. The final column in the table presents a sum of all carryover RINs retired by obligated refiners to meet the annual RVO above a sum of all RINs (both current year and carryover) retired.

Table 4: RINs Used for Compliance by Obligated Refiners, Including Carryover RINs, 2010-2013

	RIN Year	D4 RINs	D5 RINs	D6 RINs	Total Carryover and RINs retired to meet overall RVO
2010 Compliance Year[1]		N/A	N/A	N/A	
	2010	166,232,179	23,720,991	3,441,123,591	3,631,076,761
2011 Compliance Year[1]	**2010**	49,966,029	2,669,842	1,920,351,778	1,972,987,649
	2011	1,027,143,577	152,386,595	7,769,788,969	10,922,306,790
2012 Compliance Year	**2011**	268,961,057	49,103,786	3,060,020,326	3,378,085,169
	2012	1,254,882,608	415,495,440	10,090,718,261	15,139,181,478
2013 Compliance Year	**2012**	244,478,487	156,284,147	2,040,007,535	2,440,770,169
	2013	1,939,160,352	485,169,551	11,476,873,108	16,341,973,180

Did Obligated Parties Have Difficulty With the Blend Wall?

The FAPRI authors theorize that RIN prices would rise in response to market shortages of RINs, once refiners and importers are unable to blend ethanol into

obligated gasoline volumes beyond the 10 percent limit. EPA's newly released data reveals that the amount of ethanol blended into the U.S. transportation fuel supply exceeded 10 percent by 2011.

RINs separated in any given year (whether retired, expired or carried over to the following year) represent biofuel blended into transportation fuel. Table 5 below presents a calculation of all D6 and D5 RINs separated from ethanol each year that were eventually retired, carried over, or expired unused. The ratio of RINs generated and assigned to ethanol gallons is applied to those retired, carried over and expired unused. It could be the case that all D5 and D6 RINs that expired unused were separated from ethanol (and conversely, those RINs retired were from biomass-based diesel). That would directly counter the theory that obligated parties were "banking" ethanol RINs to forestall the blend wall. Regardless, the RINs that expired unused still represent ethanol blended into the transportation fuel supply. Further, eliminating expired unused RINs from the calculation would lower the rate of ethanol blended by only a few tenths of a percent.

	2010	2011	2012	2013
D6 RINs retired	3,838,694,623	9,184,154,593	10,555,225,166	11,923,667,579
D6 RINs carried over	2,241,455,041	3,169,954,134	2,087,485,067	
D6 RINs expired unused	426,649,448	469,306,771	11,935,021	
D5 RINs retired	24,808,442	170,668,757	430,685,359	507,813,089
D5 RINs carried over	3,580,101	50,801,949	165,030,837	
D5 RINs expired unused	56,433	2,688,287	1,407,742	
Percent ethanol in D5 RINs	14.1	85.3	96.7	86.7
Total ethanol RINs used	6,492,838,486	13,008,731,909	13,230,849,241	12,139,401,347
Percent ethanol in obligated gasoline volumes	6	11	11.4	10

The number of ethanol RINs retired, carried over or expired unused in 2010 and 2013 appear to be below the blend wall because the data is incomplete. EPA does not provide RIN data from the RFS1 program, which was in effect through June 2010. But only gasoline volumes were obligated under RFS1; it is likely that the RINs carried over from RFS1 to meet 2010 RVOs primarily represented ethanol. And therefore the proportion of ethanol used to satisfy fuel obligations likely exceeded 10 percent as early as 2010.

For 2013 EPA has yet to provide the numbers of RINs carried over to 2014 or expired unused. However, EPA has reported (as of September 2016) that more than 13.2 billion 2013 D6 RINs have been retired – exceeding the 11.9 billion reported in June. Including the 1.3 billion D6 RINs retired between June and September would increase ethanol use to 11 percent of the obligated volumes. Similarly, 551 million D5 RINs have been retired as of September, exceeding the 508 million reported in June. The additional 43 million RINs likely included 37 million from ethanol.

Obligated volumes of fuel increased in 2013 as the small refiner exemption expired. The additional volumes provided obligated parties a larger pool of gasoline in which to blend ethanol, compared to 2011 and 2012, potentially easing any difficulty with the blend wall. The rise in RIN prices in 2013 therefore cannot be explained by the blend wall, since it was demonstrably easier for obligated parties to blend ethanol in 2013 than in 2011 or 2012, when RIN prices remained low.

Caveats

As made clear in the newly provided data from EPA, fuel exporters incur a separate RVO if they export RIN-bearing biofuels. The current year and carryover RINs retired by exporters are excluded from the current analysis. The deficit carryforward numbers reported by EPA include deficits for export RVOs. However, the overall ratio of RIN deficits to the annual RVOs is so small after 2011 that it has no appreciable impact on final RVOs.

It is possible that some of the ethanol used during 2010, 2011 and 2012 was blended into gasoline produced by small refiners and small refineries exempted from RFS2 obligations. Splash blending ethanol into the unobligated volumes of gasoline therefore could have provided obligated refiners and importers potential relief from the blend wall. However, exempt small refiners and small refineries could not separate RINs from renewable fuels during 2011 and 2012; to do so, they would have had to register for the program and become obligated parties. Though the exemption originally expired in 2011, many small refiners did not register for the program as they sought congressional aid in extending their exemption.

Further, obligated parties could not take possession of the additional gasoline without increasing their own obligation. They would have had to purchase the separated RINs from other parties, if they faced a shortage in their obligations. This path of relief from the blend wall would therefore have presented a potential difficulty for obligated parties in meeting obligations; and under the theory, a shortage of RINs should have raised prices.

Implications for Policy

Newly released data refutes the theory that price spikes in spot trading of RINs in 2013 signaled arrival of the blend wall. Aside from the post hoc nature of such an argument, the evidence indicates that the blend wall arrived as early as 2010 and was definitively surpassed by 2012, even potentially easing slightly in 2013. The blend wall cannot serve as an explanation of the 2013 RIN price spikes, since its arrival should have caused RIN price spikes well before then.

Recently, a group of merchant refiners petitioned EPA to once again exempt them from the RFS program.[12] The petition rests on the demonstrably incorrect assumption that the 2013 RIN price spike was caused by arrival of the blend wall.

[12] *Oversight of the Renewable Fuel Standard, Hearing before the Sen. Comm. On Env't and Public Works*, 114th Cong. 10 (Feb. 24, 2016). Written Testimony of Ronald E. Minsk. http://www.epw.senate.gov/public/_cache/files/a4545f2f-52df-4f3f-8a08-e5802950d8e5/rem-rfs-written-testimony.pdf. Also, Minsk, R.E., Letter to Janet McCabe, Acting Assistant Administrator for Air and Radiation, EPA, July 24, 2015.

The original expiration of the small refiner exemption in 2011 appeared to have no effect on RIN prices or availability; therefore, reinstatement of an exemption is unlikely to have an impact in the future. In fact it could shrink the obligated volume of gasoline still further, increasing difficulty for the remaining obligated parties to meet RVOs.

EPA delayed issuing the 2013 RVOs until August of that year as it considered the assumed arrival of the blend wall and the potential difficulty for refiners to meet annual RVOs that year. The agency eventually stuck with the statutory volume; nevertheless, it delayed the compliance deadline for the 2013 RVOs and subsequently extended the delay until March 2016.[13] The relative ease or difficulty for obligated parties to meet RVOs in 2012 and 2013 was thereby obscured until this year.

EPA also delayed issuing the 2014 and 2015 RVOs as it addressed controversy "about how the volumes should be set in light of lower gasoline consumption than had been forecast" in 2007 when Congress initially set the statutory volumes of biofuel – referring to the blend wall.[14] The agency eventually established RVOs for 2014, 2015 and 2016 in a single rule made public in November 2015, while at the same time denying petitions from refiners for a waiver of the 2014 RVOs. The refiners' petition argued that a shortage of available RINs – due to their inability to blend ethanol above 10 percent of gasoline volumes – would severely harm the economy through an increase in fuel prices.[15] Despite rejecting the petition, EPA waived significant volumes from the congressionally set schedule of biofuel production and use for 2014, 2015 and 2016. It further refused to set higher RVOs in those years, arguing that doing so would force obligated parties to draw down the "bank" of carryover RINs.

EPA's delays in setting the 2013, 2014, and 2015 RVOs combined with the unwarranted changes to the RFS program finalized for 2014-2016 caused direct

[13] 79 Fed. Reg. (34242). Monday June 16, 2014; 79 Fed. Reg. (46353). Friday, Aug. 8, 2014.
[14] 79 Fed. Reg. (73007). Tuesday, Dec. 9, 2014.
[15] 80 Fed. Reg. (77428-29). Monday, Dec. 14, 2015.

harm to biofuel producers and increased greenhouse gas emissions from the transportation sector. BIO estimates that EPA's new methodology for setting annual RVOs has caused a $22.4 billion shortfall in necessary investment in advanced biofuels. Investment patterns clearly demonstrate that EPA is sending a sustained market signal that disincentivizes advanced biofuels.[16] Further, EPA's rule changes cut short the effectiveness of the RFS program for greenhouse gas emission reduction by limiting market space for renewable fuels and guaranteeing more market space for petroleum fuels. BIO estimates that transportation-related greenhouse gas emissions (measured in CO2e) increased by 72 million metric tons in 2014 and again by 22.9 million metric tons in 2015, from year to year. Further, based on EIA projections, BIO estimates that greenhouse gas emissions will increase in 2016 by 6.9 million metric tons, compared to 2015. And in 2017, emissions will increase by 16.8 million metric tons, if EPA finalizes the volumes it proposes.[17]

The 2013 price spikes in spot market RIN trading remain unexplained. Further research into the true causes of RIN price spikes is hampered by lack of data on the volumes of RINs traded and actual prices paid for RIN transfers in 2013.

EPA has again proposed to provide unwarranted relief from the blend wall to obligated parties in the 2017 RVOs.[18] EPA should reconsider this course of action in light of data disproving the relationship between high RIN prices and the blend wall.

[16] Biotechnology Innovation Organization. (2016) "Estimating Another Year of Chilled Investment in Advanced Biofuels Due to RFS Uncertainty." Washington, DC. https://www.bio.org/sites/default/files/Estimating_Another_Year_of_Chilled_Investment.pdf
[17] Biotechnology Innovation Organization. (2016). "BIO Comments on Renewable Fuel Standards for 2017." https://www.bio.org/letters-testimony-comments/bio-comments-renewable-fuel-standards-2017.
[18] 81 Fed. Reg. (34778). Tuesday, May 31, 2016.

Appendix: Calculation of Ethanol RINs from RINs Generated

EPA reports annual RIN generation and biofuel production by fuel type in its public data for the Renewable Fuel Standard. The ratio of RINs generated for ethanol to those generated for biomass-based diesel during the 2010- 2013 time period is presented below in Appendix Table 1. Other types of fuel that generate RINs available to satisfy the RFS – such as naptha, compressed and liquefied natural gas, or heating oil – are not counted since they are not blended into the obligated volumes of gasoline and diesel.

	2010	2011	2012	2013
D6 biomass-based diesel RINs	18,779,478	6,258,577	1,118,519	251,525,451
D6 ethanol RINs	6,777,308,371	13,609,057,120	12,986,723,082	13,098,970,936
Ratio of ethanol	99.7	100	100	98.1
D5 biomass-based diesel RINs	24,568,615	33,385,319	20,728,997	70,172,481
D5 ethanol RINs	4,043,017	193,748,805	603,461,683	458,250,657
Ratio of ethanol	14.1	85.3	96.7	86.7