

Impacts of Options for Modifying the Renewable Fuel Standard

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The Renewable Fuel Standard (RFS) was created in 2005 and modified in 2007 with the objective of increasing production and consumption of renewable fuels beyond the levels that markets would otherwise deliver [1, 2]. Congress wanted to increase renewable fuels to achieve three main objectives: 1) reduce greenhouse gas (GHG) emissions, 2) reduce dependence on foreign oil, and 3) increase incomes and economic well-being of US rural residents [3]. The RFS has been successful in achieving all these objectives.

Today, some are questioning the cost of the RFS arguing that the cost of Renewable Fuel Identification Numbers (RINs) imposes an undue burden on some of the parties obligated by the RFS (mainly fuel refiners and importers). Without making judgment on the validity of that argument, the objective of this note is to examine options for addressing RIN prices.

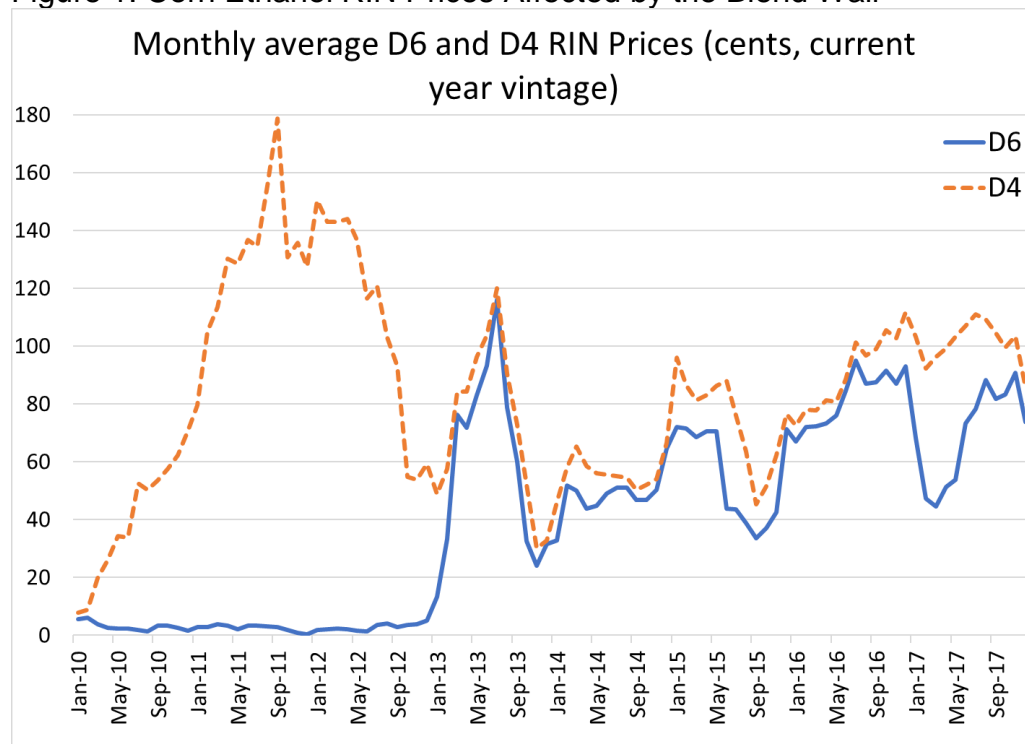
What is driving ethanol RIN prices?

Before examining specific options, we will describe briefly why RIN prices are elevated. When the revised version of the RFS was enacted in 2007, annual gasoline consumption was 142 billion gallons and was expected to continue to increase as it had in the past (about 1.3%/year). Had that happened, gasoline consumption would have grown to over 150 billion gallons annually by 2014, and would have allowed the RFS conventional biofuel level of 15 billion gallons to be satisfied simply by blending corn ethanol at the 10% level (E10). However, following 2007, gasoline consumption fell and did not even reach the 2007 level again until 2016 when it reached 143 billion gallons. Thus, the 15 billion gallon RFS mandate could not be absorbed by the gasoline market creating what is known as the blend wall. The drop in gasoline consumption was due to two main factors. First, the great recession of 2008-09 led to a large drop in gasoline consumption, and it took quite a while for growth to return. Second, the US enacted much more stringent fuel economy standards, which meant consumers could drive more miles with less fuel. High oil prices also encouraged consumers to purchase more fuel-efficient vehicles and perhaps to drive a bit less.

Movements in the ethanol (D6) RIN markets illustrate the blend wall issue. In 2010-12 and most earlier periods prior to December 2012, the highest ethanol RIN price was around 4 cents/gal. except for a couple of months in 2008-09 at the height of the great recession and plunging crude oil prices. Then in 2013 ethanol D6 RINs escalated as illustrated in Figure 1 and generally followed D4 RINs for most periods after that. The reason is that because the blend wall was binding, biodiesel RINs were needed to make up at least part of the difference between the conventional biofuel RFS level and the lower

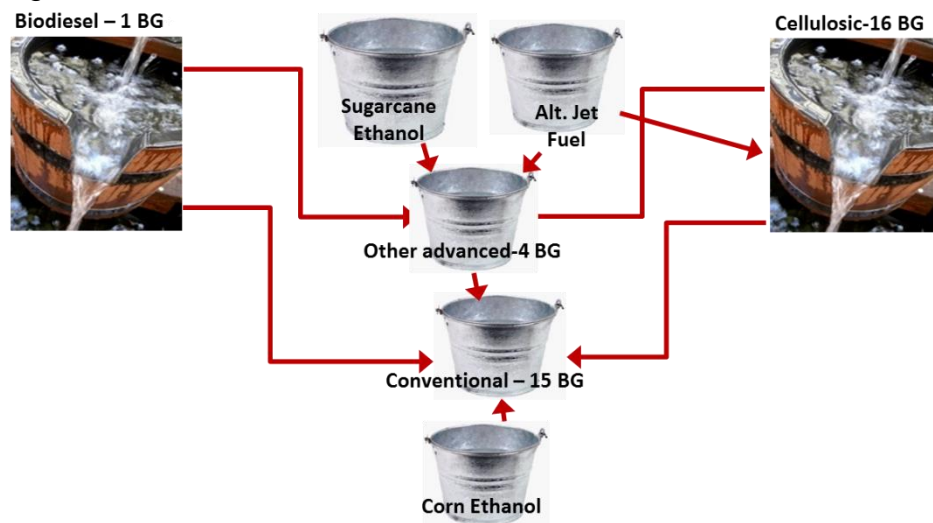
blend wall. This possibility is due to the nested structure of the RFS as illustrated in Figure 2. Due to the nesting, biodiesel, cellulosic, and other advanced RINs can be used also to satisfy the conventional biofuel mandate. Thus, because of the ethanol blend wall, biodiesel RINs were needed to bridge the gap between the conventional (ethanol) RFS level and the blend wall. Thus, biodiesel RINs became the marginal RIN for the conventional category pulling up the ethanol RIN price. That situation remains today.

Figure 1. Corn Ethanol RIN Prices Affected by the Blend Wall



Sources: Argus Media and OPIS

Figure 2. Nested structure of the RFS



Source: Authors

Before the blend wall became a major driver of ethanol RIN prices, they were quite low. After the blend wall became a major issue, ethanol RIN prices have tended to follow the higher biodiesel and other advanced RIN prices. Thus, the blend wall is the major driver of current higher ethanol RIN prices.

Options to lower elevated RIN prices

In this analysis, we will focus on two main options:

- 1) Increasing the base ethanol blending percentage from 10% to 11%
- 2) Imposing a price cap on ethanol (D6) RINs

We will also provide a discussion of the possible impacts of granting a year-round Reid Vapor Pressure (RVP) waiver for E15, which potentially could increase ethanol sales. In recent discussions, this option is usually considered in combination with a price cap on RINs.

Increase in the base blending level to 11%

DOE [4] forecasts 2018 gasoline consumption at 143.065 billion gallons. The E10 blend wall (using a max of 9.9%) is 14.16 billion gallons of ethanol, considerably below the RFS level of 15 billion gallons. However, if the base blending level were increased to 11%, the blend wall (using 10.9%) would become 15.59 billion gallons, above the RFS level. In other words, increasing the blending percentage by just 1% could solve the blend wall problem and reduce RIN prices dramatically. The RFS level could be met with existing ethanol production capacity, and one would expect ethanol RIN prices to fall to the range they followed prior to 2013 (i.e., less than 10 cents). There would be no need for a RIN price cap because neither the blend wall nor the RFS level relative to production capacity would be binding constraints. Biodiesel RINs would no longer be needed to comply with the conventional biofuel RFS level, so the coupling of D4 and D6 RIN prices would be broken.

There are, of course, uncertainties and issues to be considered with this option. First, the regulatory pathway to facilitate such a change the base blending percentage is beyond the scope of this analysis. Second, auto manufacturers would need to buy-in to the slightly higher blending percentage. However, we see no compelling reason why they would contest this change, as the majority of new light duty automobiles are approved by the automaker to use E15, and EPA has legally approved up to E15 for all vehicles built after 2000. Third, there may be some minor logistical issues in making the change.

Imposing a price cap on ethanol RINs

In much of the literature, the RIN price is illustrated as the difference between the biofuel supply curve and demand curve (driven by fossil fuel price) at the RFS level. However, that illustration does not hold for ethanol with a blend wall and with the nested RFS structure. The blend wall would be a vertical line to the left of the RFS and would represent the effective ethanol demand. The gap between the blend wall and the RFS has to be filled with other non-ethanol biofuels, or an increase in E15 and/or E85 blending.

Second, this method of illustration essentially assumes that the RFS is necessary to get the ethanol capacity in place, but the current reality is that the ethanol capacity is already in place. In other words, that part of the RFS functioning has already been accomplished. Abbott argues that the main function of the RFS has been to get the capacity built [5]. Given that the capacity is already in place, it is hard to know what ethanol RIN prices would be absent the blend wall.

The price cap would significantly change biofuel market behavior. It would not be attractive to use biodiesel to comply with the conventional mandate because the RIN prices would be too low to elicit the incremental biodiesel production. Another consequence of the RIN price cap is that it would no longer be economically attractive to produce or consume E85. The higher RIN prices provide an incentive to consume E85 because they permit its pump price to be considerably lower than E10 blends. With a low RIN price, that is no longer the case. It appears that the most likely outcome of a RIN price cap is that the ethanol and overall renewable fuels mandates simply could not be achieved. Thus, the RIN cap reduces the overall blending level. The blend wall still exists, so with the decline in E85, the effective blend wall falls further, and less ethanol could be used. It also would not be attractive to use biodiesel or other advanced biofuels.

Now we turn to the potential for year-round E15 sales to expand sufficiently to fill the blend wall gap. Our assessment is in line with the conclusion of Irwin and Good [6]:

The bottom line of this analysis is that the RVP waiver is just one of several factors that have held back the growth of E15 in the U.S. Removing the impediment of the current RVP waiver would certainly give a boost to E15 use but it would not address the other factors restricting growth. From the perspective of the grand bargain on the RFS, the gains with respect to ethanol use would likely be small in the short-run.

Only a very small fraction (1%) of US gasoline stations provide E15. It would take quite some time to build out the infrastructure (if ever) to enable significantly increased E15 sales. The RVP waiver coupled with the RIN cap simply does not help the situation.

The other issue in the current discussion is the possibility of permitting blenders to purchase a waiver credit to avoid blending biofuel (akin to current RFS policy for cellulosic biofuels). For the cellulosic waiver credit, blenders must purchase a credit and an advanced biofuel RIN to avoid blending their required volume of cellulosic biofuel. If the proposed ethanol waiver credit were to function like the cellulosic waiver credit and both the RIN cap and the waiver credit prices were set at \$0.10/gal., then the total cost of avoiding blending ethanol would be \$0.20. With this option, blending very likely would fall from current levels. If the obligated parties were required only to purchase the waiver credit (without a requirement to also purchase a RIN), blending would fall substantially, probably to render total ethanol consumption less than the blend wall. In other words, with this policy in effect, the original objectives of the RFS could not be achieved. Also, there is a “good faith” argument that private sector investors built up the US ethanol capacity believing the government would maintain the RFS. If the credit waiver were included,

some of the plants likely would go out of business because the waiver credit effectively reduces the renewable fuel mandate.

Quantitative analysis

We developed an economic partial equilibrium model that includes crude oil, gasoline, ethanol, corn, soybeans, DDGS, and ethanol RIN prices. An earlier version of this model was used for several academic papers [7-9]. We simulated both the RIN price cap and the increase in base blending level to 11% using this model. What happens with the RIN price cap is that ethanol domestic consumption stays at the blend wall level (now lower because of the drop in E85). Biodiesel and biodiesel RINs are not in the model, but we can project that biodiesel production would fall because it would not be profitable to use it to fulfill the gap between the E10 blend wall and RFS mandate. Thus, while the ethanol price cap would reduce ethanol production and consumption somewhat, it definitely would reduce overall biofuel production and consumption because the conventional (or overall) mandate could not be achieved.

When we simulate the increase in the base blending level to 11%, ethanol domestic consumption increases dramatically taking it to the RFS level of 15 billion gallons. Since neither the blend wall nor the RFS are now binding, ethanol RIN prices fall to very low levels akin to the levels experienced prior to 2013. Thus, the ethanol RFS conventional biofuel mandate is filled with ethanol, and biodiesel production is no longer needed to fill the blend wall gap.

Conclusions

The RINs market is doing what it was designed to do. It provides the necessary incentives to elicit production and consumption of renewable fuels as mandated by Congress. Imposing a cap on RIN prices would prevent the market from achieving the renewable fuel objectives. Because of the complexity of the market and the blend wall, it is difficult to precisely forecast quantitative impacts, but the directions of change are all clear.

Our conclusion is quite simple. Any of the options employing a RIN price cap would prevent achieving the objectives of the RFS. The year-round RVP waiver for E15 would do little to ameliorate the situation in the near term. The option of increasing the base blending level by 1% quickly moves the blend wall above the RFS level, and ethanol RIN prices drop dramatically. This option is a clearly superior if implementation issues can be solved.

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