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The Effect of a Higher Ethanol Blend RVP Waiver on RIN Prices

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Summary

Gasoline with 10% ethanol (E10) has higher evaporative emissions than petroleum gasoline. The standard measure of evaporative emissions is the Reid Vapor Pressure (RVP). To facilitate year-round sales of E10, Congress granted a RVP waiver (with restrictions) for E10. Mid-range blends, between 10% and 50% ethanol, have the same or lower RVP as E10, but currently are not eligible for the E10 RVP waiver. As a result, mid-range blends, in particular E15, are generally unavailable during the summer ozone season. Congress is currently considering legislation to extend the E10 RVP waiver to all ethanol blends of E10 and higher (S. 517 and H.R. 1311). This note examines the interaction between extending the RVP waiver to mid-range ethanol blends and the price of tradable compliance certificates (RINs) under the Renewable Fuel Standard (RFS).

Extending the RVP waiver to E15 (and higher blends) would facilitate additional corn kernel ethanol being blended into the fuel supply, as some E10 sales are converted to E15 sales. This additionally blended ethanol would make it easier to comply with the RFS obligation for blending conventional fuels, because more D6 RINs would become available for compliance. The annual conventional volumetric requirement is already at its statutory maximum of 15 billion gallons, so these additional RINs would exert downward pressure on RIN prices. Additional sales of E15, along with the continued expansion of total gasoline demand, would tend to stabilize RIN prices at a lower value, all else equal. The extent of this RIN price reduction and stabilization would depend on the success of E15 marketing and availability, paired with the RVP waiver extension.

RVP Background

RVP is a measure of how evaporative a liquid is. Higher RVP values imply more evaporative fuel emissions, which contributes to low-level ozone. As ethanol is added to petroleum blendstock, the RVP increases initially, plateaus at blends in the range of 10-15% ethanol, then slowly declines (Figure 1). The Clean Air Act limits gasoline to a maximum RVP of 9 pounds per square inch during the ozone season, but grants a waiver of an additional 1 psi to ethanol blended at 10%. The bills under consideration propose to extend the E10 RVP 1 psi waiver to all ethanol blends of 10% and higher.

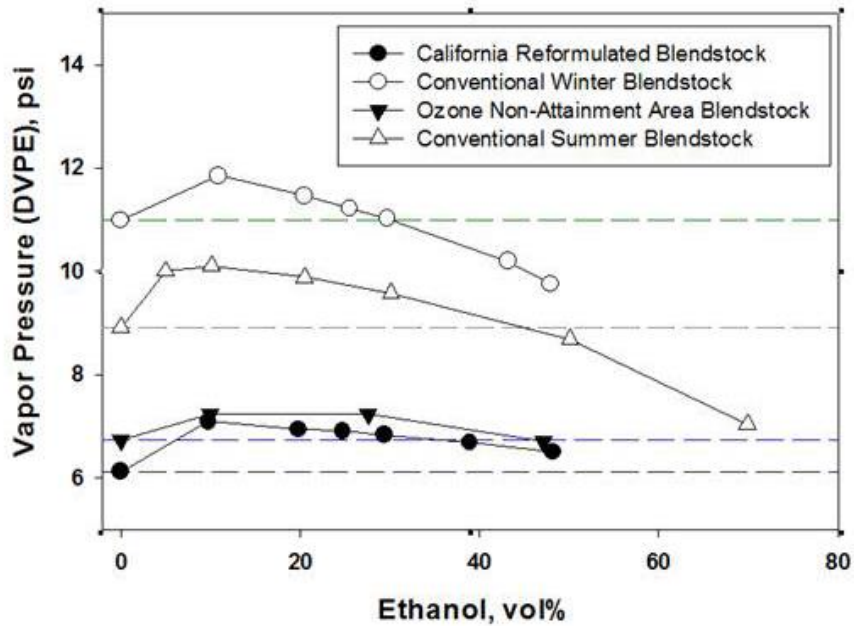


Figure 1. RVP for Ethanol-Gasoline Blends.
Source: Johnson et. al. (2015)

Because the RVP of E15 is essentially the same as E10 for a given blendstock, extending the waiver to E15 would not increase the RVP of fuels sold. However, it would permit the summer sale of E15 produced from the same blendstock as E10. This would facilitate sales year-round E15 sales, for example via a blender pump with a two-tank system of E10 and E85.

The E10 RVP waiver has exceptions and regional nuances, however those details are not important for the analysis here. See the Congressional Research Service report on S. 517 and H.R. 1311 (Bracmort (2017)) for details.

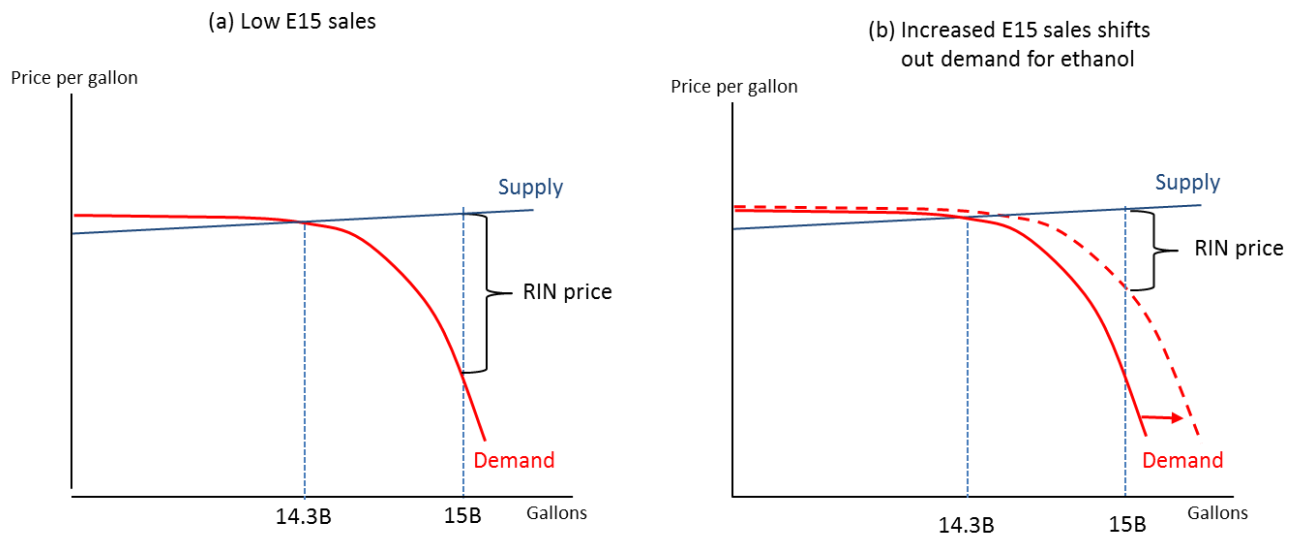
Effect of Extending the RVP Waiver on RIN Prices

Refiners and importers of petroleum fuels (“obligated parties”) demonstrate compliance with the RFS by turning in RINs to the EPA for each gallon of petroleum fuel that the obligated party sells as surface transportation fuel. Different fuels generate different types of RINs: D4 for advanced biomass-based diesel, D5 for other advanced renewable fuels, and D6 for conventional fuels. EPA determines the fraction of each of these RINs obligated per gallon of petroleum fuel in an annual rulemaking.

The prices of RINs are determined by supply and demand, and, because RINs are bankable, by expected supply and demand. Figure 2 illustrates the fundamentals of D6 RIN price determination, with the simplifying assumption that all ethanol is conventional and the only conventional fuel is corn kernel ethanol. The left panel illustrates the current situation, with low E15 sales. For quantities of ethanol up to 10% of gasoline, the demand for E10 is flat and is driven by the octane-enhancing aspects of ethanol.

Beyond 10%, however, additional ethanol must enter the gasoline supply through higher blends – historically, through E85. As illustrated, if the total quantity of gasoline is 143 billion gallons (the projection EPA (2017) uses in its 2018 proposed rule, Table V.B.1.iii-1), then 10% of that is 14.3 billion gallons. If the renewable volumetric obligation (RVO) were 14.3 billion gallons, then the RIN price would be zero because that amount can be supplied through E10 (assuming no sales of E0). But for 2017 and 2018 and very plausibly thereafter, the conventional RVO is 15 billion gallons. The 15 billion gallon RVO leaves a gap of 700 million gallons in excess of the ethanol that can be supplied through E10.¹ If the only way to fill this gap is by selling E85, then consumers will need a price discount to buy E85, which has lower energy content than E10 and is generally less convenient to purchase.² The price of the D6 RIN is determined as the additional incentive the consumer needs to purchase that extra ethanol in the form of E85; this RIN price is the difference between what producers must pay to ethanol suppliers, and the price they can sell it to consumers. Experience has shown that a D6 gap which is small compared with the 143 billion gallons in the fuel supply can lead to high D6 RIN prices.

Figure 2. E15 Expansion and RIN prices:
Supply and demand for corn ethanol



The right panel of Figure 2 illustrates the effect on RIN prices of extending the E10 RVP waiver to higher blends. Assuming that extending the RVP waiver leads to more E15 sales, more ethanol will be consumed. Thus, the demand for ethanol increases: in the figure, the demand for ethanol shifts out. This

¹ EPA (2017) estimates the total volume of gasoline (G) in 2018 to be 142.9 billion gallons (Table VII.C-1); this excludes Alaska.

² Blended at 83% ethanol, the per-gallon energy content of E85 is 73% that of E10.

reduces the RIN price needed to induce the marginal E15 or E85 consumer to buy a higher blend. Said differently, because of E15 sales, more RINs are available, driving down the price of RINs.³

How Far Would RIN Prices Fall With the RVP Waiver Extension?

The answer to this question depends on the extent to which extending the RVP waiver leads to more E15 sales. Such an extension has no direct historical analog, and I am not aware of credible econometric estimates of the demand for E15. Thus there is no solid empirical basis for estimating the quantitative boost to E15 sales from relaxing the RVP waiver. This said, there is some relevant quantitative evidence.

As a rough calibration, historical experience suggests that 200 million gallons of D6 RINs produced through E15 sales could exert substantial downward pressure on RIN prices. Producing 200 million gallons of additional D6 RINs from E15 would require converting 4 billion gallons of E10 sales to E15. Whether such an expansion is plausible is a matter of controversy. On the up side, the number of stations offering E15 increased substantially under the USDA Biofuel Infrastructure Program and the private Prime The Pump program; EPA (2017, p. 65) estimates that the number of E15 stations could reach 2700 in 2018. Korotney (2016) estimates 2017 E15 sales to be 687 million gallons, more than twice 2016 sales. These are nine-month sales so would be expected to increase with the RVP waiver. Also, although E15 price data are poor, the limited available data suggests that E15 sells at a sufficient discount, relative to E10, to more than compensate for its 1.7% reduction in energy content (not taking into account its higher octane than E10).⁴ On the down side, E15 is a fuel that is largely unknown to the consumer, a few foreign manufacturers still recommend against using E15 in new vehicles, and E15 is

³ To keep things simple, this discussion has implicitly assumed that: (i) the only conventional fuel is corn kernel ethanol, (ii) there is no RIN banking, (iii) D4 and D5 RINs cannot be used to meet the D6 mandate, and (iv) RIN prices are passed through to the E85 consumer. For the following reasons, none of these features change the qualitative discussion here. (i) The discussion treated the marginal RIN as coming from E85 sales. If the marginal RIN comes instead from imported conventional renewable diesel, the dynamics are the same because E15 sales increase the number of RINs. (ii) RIN banking means that RIN prices also reflect expected market dynamics. To the extent that E15 sales are expected to increase over time because of consumer awareness and increased numbers of E15 retail stations, these expected future sales would serve to create additional downward pressure on RIN prices. (iii) Since the release of the 2017 final rule, a substantial gap has opened between the D4/D5 and D6 RIN prices, indicating that D4 and D5 RINs are not being used to meet the conventional renewable RVO. With the D6 RIN price already separated from the D4 and D5 prices, more E15 sales would put downward pressure on D6 prices and leave D4 unaffected. In principle D5 prices could also fall somewhat because more E15 sales make room for more cane ethanol as well. (iv) There is substantial evidence that RIN prices are not passed through to the E85 consumer, except in mature markets with high E85 station density (Li and Stock (2017)). This lack of pass-through is one reason the demand curve is steep for ethanol volumes in excess of E10 capacity.

⁴ Source: E15 prices on E85prices.com, accessed July 8, 2017, and the Prime The Pump Progress Report, June 15, 2017.

available almost exclusively at independent retailers. While the unavailability of the RVP waiver is an important impediment to E15 sales, it is safe to say that the extension of the RVP waiver to higher blends will need to be paired with aggressive marketing and consumer education by retailers to see large expansions in E15 sales.

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