Center for Growth and Opportunity at Utah State University

Public Interest Comment on the US Environmental Protection Agency proposed rule

Modifications to Fuel Regulations to Provide Flexibility for E15 and to Elements of the Renewable Identification Number Compliance System

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Docket ID: EPA-HQ-OAR-2018-0775

Submitted: April 29, 2019

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Executive Summary

Thank you for the opportunity to comment on the Environmental Protection Agency's (EPA) proposed rule change, "Modifications to Fuel Regulations: Provide Flexibility for E15; Modifications to RFS RIN Market Regulations." The proposed rule change would permit year-round E15 sales and enact a number of modifications to the market for RINs to minimize the potential for speculative trading.

As an economist and policy scholar, I have studied the environmental impacts of the Renewable Fuel Standard (RFS) and written a review piece on the subject. Permitting year-round E15 sales introduces a number of environmental concerns that are inadequately addressed by the proposed rulemaking. Specifically, the proposal's exclusive reliance on EPA models and simulations of tailpipe emissions ignores alternative methodologies that more credibly reveal ethanol's environmental impact on urban transportation emissions. Moreover, the proposal's sole focus on tailpipe emissions does not address the numerous environmental problems associated with the lifecycle of ethanol production that would be aggravated by further ethanol expansion.

Understanding the environmental ramifications of the proposed rulemaking requires first understanding how permitting year-round E15 sales would interact with the Renewable Fuel Standard and demand for ethanol broadly. Thus, the comment proceeds by giving an overview of how the blend wall presently constrains further ethanol mandate expansions, how the proposed rulemaking would relax that constraint, and finally how expansions in the ethanol mandate would ultimately affect the environment.

The Blend Wall Constrains EPA's Ability to Require Additional Ethanol Blending Under the RFS

Numerous roadblocks prevent the consumer fuels industry from selling substantially more ethanol. Among these are consumer disinterest in purchasing flex fuel vehicles that can run on higher ethanol blends, the large portion of the US vehicle fleet that cannot use ethanol blends in excess of 15% (E15) or even 10% (E10), and the lack of widespread fueling infrastructure to supply potential E85 customers. On top of these issues is the regulatory barrier to E15 sales that is the subject of the current rulemaking. Jointly, these barriers are referred to as the "blend wall," which make it costly for refiners to comply with volumetric ethanol sales mandates that exceed some fixed percentage (roughly 10%) of yearly US gasoline sales.[1] At many times in the RFS' history, the prices of D6, D5, and D4 Renewable Identification Numbers (RINs) have been nearly equal because refiners are forced to invoke the nested structure of the mandate to use biomass-based diesel for marginal compliance when there is simply no more room for ethanol.[2] When refiners use relatively expensive biomass-based diesel to comply with the conventional biofuel mandate, that's strong evidence that the blend wall constraint binds their ability to blend additional ethanol.

Because the ethanol mandate volumes set by Congress under the Renewable Fuel Standard are intentionally optimistic, the EPA routinely issues waivers to bring the mandate down to realistic levels. Even after these waivers, both the 2018 and 2019 RFS final rules included 15 billion gallons of conventional ethanol mandates, the statutory maximum.[3] This would seem to suggest that further conventional ethanol mandate expansions are not possible under the current law. This view is mistaken. Because the conventional ethanol mandate is technically a misnomer--it refers to the portion of the total biofuel mandate not accounted for by nested compliance with the advanced, cellulosic, and biomass-based diesel mandates--the EPA could increase the implied conventional mandate to more than 15 billion gallons by issuing cellulosic waivers without adjusting applicable volumes elsewhere. The EPA has only adjusted advanced and conventional applicable volumes to account for cellulosic waivers since 2014, and reversing course is certainly within the realm of possibility.[4] With cellulosic ethanol production missing statutory targets by more than an order of magnitude, the EPA has substantial room to expand conventional ethanol mandates.

The blend wall also provides an important constraint to policymakers when thinking beyond the Renewable Fuel Standard. Even if the EPA never elects to expand conventional ethanol mandates beyond 15 billion gallons under the current RFS, Congressional action or other policy changes surrounding the 2022 expiration of statutorily-defined RFS volumes could threaten to expand conventional ethanol production with a relaxed blend wall.

Allowing Year-Round E15 Changes the Blend Wall Constraint and Allows for Mandate Expansions

Allowing additional E15 sales relaxes the blend wall constraint imposed by current law. Though many vehicles in the US fleet are already approved for E15 fueling, regulatory limitations prevent E15 from reaching greater market penetration, for reasons already explained in the proposed rulemaking.

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1 Gabriel E. Lade, C.-Y. Cynthia Lin Lawell, and Aaron Smith, "Designing Climate Policy: Lessons From the Renewable Fuel Standard and the Blend Wall," *American Journal of Agricultural Economics* 100, no. 2 (2018): 585-599, https://doi.org/10.1093/ajae/aax092.
2 Jarrett Whistance and Wyatt Thompson, "A Critical Assessment of RIN Price Behavior and the Implications for Corn, Ethanol, and Gasoline Price Relationships," *Applied Economic Perspectives & Policy* 36, no. 4 (2014): 623-642, https://doi.org/10.1093/aepp/ppu012; Scott Irwin, "Rolling Back the Write Down of the Renewable Mandate for 2014: The RINs Market Rings the Bell Again," *farmdoc daily* 4 (2014): 148, https://farmdocdaily.illinois.edu/2014/08/rolling-back-the-write-down-of-renewable-mandate-2014.html.
3 Congressional Research Service, "The Renewable Fuel Standard (RFS): An Overview," 2019, https://fas.org/sgp/crs/misc/R43325.pdf.
4 Congressional Research Service, "The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes," 2019, https://fas.org/sgp/crs/misc/R44045.pdf.

Given the role of the blend wall constraint in influencing the EPA's historical yearly RFS rules, the result of the current rulemaking, if implemented, is likely to be an expansion of US ethanol mandates. In fact, the language of the proposed rulemaking itself seems to indicate that this is the explicit goal. Section II.F.1 claims that one benefit of an E15 RVP would be to "help to further the use of increased volumes of renewable fuels under the RFS program[.]"

The belief that year-round E15 would induce higher ethanol mandates motivates many of the consumer choice concerns voiced by other comments.[5] If mandates expand to the newfound slack in the blend wall resulting from year-round E15 sales, owners of motorboats, recreational vehicles, and small engines may experience an even harder time finding appropriate fuels. If expanded ethanol mandates are the likely outcome of the proposed rulemaking, the consequences of those mandates need to be considered when analyzing the proposal.

Higher RFS Mandates Will Aggravate Existing Environmental Issues

Last year, I reviewed the research investigating the environmental effects of the RFS for the Center for Growth and Opportunity at Utah State University.[6] A full copy of this report is included as an attachment to this comment. The conclusions are broadly consistent with a number of pieces released by the National Wildlife Federation[7] and the Environmental Protection Agency's own Second Triennial Report to Congress[8] in finding that the mandate for conventional biofuels harms the environment. The report includes brief sections on tropospheric ozone (O_3) and nitrogen oxide (NO_x) emissions, which should be of particular interest to this Clean Air Act rulemaking, but the holistic impact of additional ethanol blending on the environment is the driving focus of the paper. In the remainder of this section, I review a number of environmental economics papers that inform how additional ethanol blending impacts criteria air pollutant with a particular focus on ozone.

The proposed rulemaking uses the EPAct model to predict how E15 impacts ozone precursors but stops short of directly enumerating how ambient ozone levels would be affected. As the proposed rulemaking admits, modeling how the composition of the atmosphere responds to transportation fuel changes is difficult. In fact, simulations, smog chambers, and analysis of tailpipe emissions often disagree over whether a given fuel transition will increase or decrease ozone in a given locale.[9] Therefore, examining the EPAct modeling results does not provide a full picture of the likely effects from the proposed rule change.

Instead of estimating atmospheric pollution responses to fuel changes using simulations, smog chambers, or other such methodologies, recent research by environmental economist Alberto Salvo directly examines how São Paulo's pollutant levels responded to fluctuations in ethanol consumption. E100 and E20/25 blends are São Paulo's primary consumer fuel options and are ubiquitously available throughout the city.[10] An initial article published by Salvo and atmospheric chemist Franz M. Geiger in *Nature Geoscience* demonstrated that ambient ozone levels in São Paulo fell 20% as the share of Brazil's flex fuel vehicle

5 Commenters submitted several comments about this rulemaking that are along these lines to the EPA, e.g. Michael Sayre, American Motorcyclist Association, Comment ID: EPA-HQ-OAR-2018-0775-0073, Tracking Number: 1k3-98wg-q5vy, https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0775-0073.

6 Arthur R. Wardle, "A Review of the Environmental Effects of the Renewable Fuel Standard's Corn Ethanol Mandate," September 2018, https://www.growthopportunity.org/research/policy-papers/environmental-effects-rfs-corn-ethanol-mandate/

7 National Wildlife Federation, "New Research Proves Biofuels Policy Driving Environmental Harm," March 2019, https://www.nwf.org/Home/Latest-News/Press-Releases/2019/03-07-19-Biofuels-Environmental-Harm

8 U.S. EPA., "Biofuels and the Environment: The Second Triennial Report to Congress," 2018, https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=IO&dirEntryId=341491

9 Alberto Salvo and Yi Wang, "Ethanol-Blended Gasoline Policy and Ozone Pollution in Sao Paulo," *Journal of the Association of Environmental and Resource Economists* 4, no. 3 (2017): 731-794, http://dx.doi.org/10.1086/691996.

10 Alberto Salvo, Joel Brito, Paulo Artaxo, and Franz M. Geiger, "Reduced ultrafine particle levels in São Paulo's atmosphere during shifts from gasoline to ethanol use," *Nature Communications* 8 (2017): https://doi.org/10.1038/s41467-017-00041-5.

fleet electing to use gasoline (an E20 or E25 mix) rose by 62 percentage points.[11] The study also offers less precise estimates that shifting away from ethanol increased NO and CO emissions and had no significant effect on NO_2. A later study utilizing the same basic methodology demonstrated that gasoline emits significantly more unregulated ultrafine particulate matter but does not have a statistically significant impact on regulated PM2.5.[12]

Between 2010 and 2013, Brazil's government changed the legally-mandated gasoline mixture between E20 and E25 four separate times. Notably, this change is of the exact same magnitude being considered in the rulemaking. Predictions from smog chamber studies and atmospheric modelling provided an inconclusive idea of how these changes would impact ozone. A follow-up study published by Alberto Salvo and Yi Wang in the *Journal of the Association of Environmental and Resource Economists* uses a methodology that takes advantage of these policy changes to establish a causal relationship between increased ethanol use and atmospheric ozone.[13] Their estimates are remarkably consistent across each of the four policy changes, allowing them to conclude that the E25 regime increases ambient ozone levels by 7-9 percent relative to E20. The magnitude of this effect is partially tempered by São Paulo's fleet of vehicles designed to run only on E100; the increase could have been larger if the policy change had impacted the entire vehicle fleet, as a widespread shift to E15 would in the United States.

Extrapolating São Paulo's experience to other cities should only be done cautiously, as the researchers in the above studies unanimously urge. Ethanol's emissions will impact cities differentially according to their pre-existing levels of volatile organic compounds (VOCs) and NO_x emissions, as well as other environmental factors like temperature and light levels. Salvo and Wang, however, note that the relevant atmospheric and environmental conditions in São Paulo do closely resemble a number of U.S. cities, including Chicago, so São Paulo is a useful case study for policymakers.

Section II.E of the proposed rulemaking says that in order to "accurately assess emission impacts in this case, [...] we need to examine current real-world circumstances." Given the difficulties in constructing simulations and smog chamber estimates of how fuel transitions impact criteria pollutants, the EPA should take São Paulo's experience as a cautionary tale of how 5-point ethanol increases in widespread gasoline blends impact real-world city atmospheres.

Expanded Ethanol Mandates Increase Environmentally Harmful Farming Practices

Though São Paulo's example is cause for concern about ethanol's contribution to air pollution, the total impact of a nationwide expansion of ethanol mandates would go beyond urban air pollution. Producing more ethanol requires additional ethanol feedstock, which would need to come from some combination of intensifying and expanding US corn farming. Because corn farming is already ubiquitous through its ideal growing region, that could mean skipping rotations, applying additional fertilizer, or converting wild habitats to corn farming. These environmentally harmful practices have already been documented in response to the existing RFS mandate levels.[14]

For further analysis of most of these environmental issues, I will refer the EPA to my attached review work, but here I would like to draw particular attention to the effects of additional fertilization. Farming in and around the Corn Belt already uses massive quantities of nitrogen fertilizer, up to 60 percent of

11 Alberto Salvo and Franz M. Geiger, "Reduction in local ozone levels in urban São Paulo due to a shift from ethanol to gasoline use," *Nature Geoscience* 7 (2014): 450-458, https://doi.org/10.1038/ngeo2144.
12 Alberto Salvo, Joel Brito, Paulo Artaxo, and Franz M. Geiger, "Reduced ultrafine particle levels in São Paulo's atmosphere during shifts from gasoline to ethanol use," *Nature Communications* 8 (2017): https://doi.org/10.1038/s41467-017-00041-5.
13 Alberto Salvo and Yi Wang, "Ethanol-Blended Gasoline Policy and Ozone Pollution in Sao Paulo," *Journal of the Association of Environmental and Resource Economists* 4, no. 3 (2017): 731-794, http://dx.doi.org/10.1086/691996.
14 Arthur R. Wardle, "A Review of the Environmental Effects of the Renewable Fuel Standard's Corn Ethanol Mandate," September 2018, https://www.growthopportunity.org/research/policy-papers/environmental-effects-rfs-corn-ethanol-mandate/.

which escapes into the atmosphere and surface waters.[15] Environmental economists estimate that every additional billion gallons of ethanol production enlarges the size of the Gulf of Mexico's hypoxic zone by around 30 square miles.[16] Research in the *Proceedings of the National Academy of Sciences* explains that even current levels of ethanol mandates make fixing the hypoxic zone "practically impossible" without unrealistic changes to farming practices.[17] Given that the EPA has erected an entire task force for dealing with the enormity of this issue under Clean Water Act authority, the impacts of further ethanol production expansion should be considered in the current rulemaking.[18]

In all, the proposed rulemaking's characterization of the environmental impacts of a widespread E15 rollout as "substantially similar" to the current E10 fuel regime does not comport with the findings of recent empirical research. The rulemaking's exclusive reliance on EPA models and simulations of tailpipe emissions is inadequate both theoretically and methodologically. Solely looking at the EPA models excludes important lifecycle emissions details such as corn farm expansion, providing an incomplete theoretical picture of the environmental effects of the rulemaking. Methodologically, the analysis of how E15 would impact criteria pollutants ignores insights from São Paulo's experience, which urges caution in taking simulations and tailpipe emissions tests at face value.

Conclusion

The conclusions of numerous scientists, policy researchers, and environmental organizations all cast doubt on ethanol mandates as effective environmental policy. My own research highlights the negative environmental impacts of mandating biofuels on emissions, land use, and fertilizer intensification. The environmental analysis contained within the current proposal fails to address the majority of these issues and inadequately covers the issues it does include.

Permitting year-round E15 sales introduces a number of environmental concerns that are inadequately addressed by the proposed rulemaking. Relying only on EPA models and simulations of tailpipe emissions ignores alternative methodologies that more credibly reveal ethanol's environmental impact on urban transportation emissions. Further, the sole focus on emissions related to the use of ethanol does not address the numerous environmental problems involved in the production of ethanol that would be aggravated by ethanol expansion.

The EPA should expand its analysis in this proposed rulemaking to fully consider the environmental consequences involved with year-round E15 sales and use additional methodological approaches to measure those consequences. Rollout of more ethanol into the nation's transportation fuel would only exacerbate the country's environmental problems and certainly would not further the Clean Air Act's ultimate objectives of environmental protection.

15 Pamela A. Porter, Robert B. Mitchell and Kenneth J. Moore, "Reducing hypoxia in the Gulf of Mexico: Reimagining a more resilient agricultural landscape in the Mississippi River Watershed," *Journal of Soil and Water Conservation* 70, no. 3 (2015): 63A-68A, http://dx.doi.org/10.2489/jswc.70.3.63A.
16 Nathan P. Hendricks, Sumathy Sinnathamby, Kyle Douglas-Mankin, Aaron Smith, Daniel A. Sumner, and Dietrich H. Earnhart, "The environmental effects of crop price increases: Nitrogen losses in the U.S. Corn Belt," *Journal of Environmental Economics and Management* 68, no. 3 (2014): 507-526, https://doi.org/10.1016/j.jeem.2014.09.002.
17 Simon D. Donner and Christopher J. Kucharik, "Corn-based ethanol production compromises goal of reducing nitrogen export by the Mississippi River," *Proceedings of the National Academy of Sciences* 105, no. 11 (2008): 4513-4518, https://doi.org/10.1073/pnas.0708300105.
18 U.S. EPA, "Mississippi River/Gulf of Mexico Hypoxia Task Force," 2019, https://www.epa.gov/ms-htf.