July 8, 2020

Attention: Docket ID No. EPA–HQ– OAR–2020–0240

U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

***Re**: Comments of the Renewable Fuels Association to Proposed Anti-Backsliding Determination for Renewable Fuels and Air Quality Pursuant to Clean Air Act Section 211(v) (85 Federal Register 35048; June 8, 2020)*

Dear Docket Clerk:

The Renewable Fuels Association ("RFA") appreciates the opportunity to comment on the Proposed Anti-Backsliding Determination for Renewable Fuels and Air Quality Pursuant to Clean Air Act Section 211(v).[1] RFA generally supports EPA's proposal to determine that "… there are no additional appropriate measures which are necessary to mitigate the potential adverse air quality impacts of required renewable fuel volumes." We agree that no additional "fuel control measures" are necessary, but we reach this conclusion for a different reason than EPA. We believe no additional measures are necessary because the scientific evidence demonstrates that increasing the concentration of ethanol in gasoline generally *improves* air quality and does not cause "adverse air quality impacts."

We remain concerned that the Anti-Backsliding Study (ABS) used to inform the proposed determination continues to rely upon an outdated and unreliable emissions model, the Motor Vehicle Emission Simulator (MOVES), to estimate the emissions impacts of ethanol-blended motor fuels. The Agency, itself, has acknowledged the ABS "has a number of limitations." Indeed, it does. We firmly believe this model and the resulting ABS report are inappropriate tools for assessing the real-world air quality impacts of renewable fuels. We have repeatedly asked the Agency to look at empirical data and real-world emissions measurements when assessing the air quality impacts of ethanol-blended gasoline, and we renew that request today.

I. RFA'S INTEREST IN THE ANTI-BACKSLIDING STUDY

As the representative of America's ethanol industry, RFA's mission is to advance the development, production, and use of fuel ethanol by strengthening America's ethanol industry

[1] Report No. EPA-420-D-20-003. Available at https://www.epa.gov/renewable-fuel-standard-program/anti-backsliding-determination-and-study.

and raising awareness about the benefits of renewable fuels. The ABS, which is mandated by the 2007 Energy Independence and Security Act, requires EPA "to determine whether the renewable fuel volumes required by this section will adversely impact air quality as a result of changes in vehicle and engine emissions of air pollutants regulated under" the Clean Air Act.[2] RFA has an interest in ensuring that the air quality benefits of ethanol—particularly the reductions in air toxics and emissions that contribute to ground-level ozone—are accurately reflected in EPA's study because the results are being used to determine whether "regulations" are necessary to "mitigate" the air quality impacts of the Renewable Fuels Standard ("RFS").[3] Recent scientific studies and analyses demonstrate that the inclusion of ethanol in gasoline provides net reductions in the emissions of key pollutants that endanger human health and contribute to ground-level ozone formation.[4] Thus, we are confident that EPA's ABS—if based on credible and sound scientific methods, data, and modeling—would have confirmed the air quality benefits attributable to growth in ethanol consumption under the RFS.

However, the Agency's use of inappropriate modeling tools, questionable methods, and flawed data has led to incomplete, unreliable, and skewed results and conclusions about ethanol's impacts on some criteria pollutants. RFA's comments herein relate largely to the underlying methodology used to form the basis for the ABS conclusions relating to the criteria pollutants assessed.

II. THE ANTI-BACKSLIDING STUDY'S RELIANCE ON THE MOVES MODEL EXAGGERATES CERTAIN EMISSIONS IMPACTS AND SKEWS THE RESULTS

MOVES2014b—EPA's current vehicle emissions modeling system—estimates mobile source emissions of criteria pollutants, greenhouse gases, and air toxics. According to multiple independent third-party reviews, MOVES2014 provides an inadequate and unreliable tool for estimating the exhaust emissions of ethanol-gasoline blends. Specifically, the model's use of data from the EPAct/V2/E-89 Fuel Effects Study mars the effectiveness of MOVES2014 with regard to ethanol-gasoline blends.

The MOVES2014 model produces inaccurate ethanol emissions results because it relies upon "match blending" methods intended to "match" specific fuel parameters, rather than the

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[2] 42 U.S.C. § 7545(v)(1).

[3] *See* Renewable Fuels Association and Growth Energy, "California Multimedia Evaluation of Gasoline-Ethanol Blends between E10 and E30 Tier I Report" Comments to California Air Resources Board (Feb. 14, 2019) at 45 ("None of the E15 studies, whether done on California fuels or other US fuels found a statistically significant increase in any criteria pollutant. NOx, CO, PM mass emissions, or organic emissions (NMOG, THC, or NMHC depending on the study) were measured. Statistically significant decreases were found for NMHC, CO and potency weighted toxics, and a marginally significant decrease in NOx emissions due to changes in ethanol content in the fuel.").

[4] *See id*. (summarizing studies); Anderson, J., Wallington, T., Stein, R., and Studzinski, W., "Issues with T50 and T90 as Match Criteria for Ethanol-Gasoline Blends," 7 *SAE Int. J. Fuels Lubr*. 3 (Nov. 2014) 1027, 1031 ("Numerous studies in which ethanol was splash-blended with a fixed gasoline blendstock have demonstrated reductions of vehicle exhaust emissions, particularly particulate matter (PM), non-methane hydrocarbons (NMHC), and the air toxics 1,3-butadiene and benzene. Particularly noteworthy is the reduction of PM emissions with the addition of ethanol, which has been demonstrated in many studies and is supported by fundamental combustion chemistry considerations.") (citing eleven studies).

"splash blending" of ethanol into commercial gasoline blendstocks—which would more closely mirror real-world gasoline blending practices. The model's questionable predictions for certain emissions result from its use of data that misrepresents the actual parameters and composition of gasoline-ethanol blends.[5] Specifically, the default ethanol blend data in the MOVES2014 model is based on the EPAct/V2/E-89 Fuel Effects Study, which created unique match-blended fuels by adjusting the gasoline blendstock to hold constant select parameters, namely the distillation temperatures (T50 and T90, the temperatures at which fifty percent and ninety percent, respectively, of the fuel are vaporized). Because the addition of ethanol to gasoline blendstock reduces the blended gasoline's T50 and T90, the study added high distillate aromatic and saturated hydrocarbons to account for and reverse ethanol's effect on T50 and T90.

As a result, the match-blended fuels in the EPAct/V2/E-89 study did not resemble actual ethanol-gasoline blends found in commerce. While the distillation temperatures between the test fuels were controlled, the addition of additional aromatics caused other inadvertent effects. For example, some fuels in the model contained unrealistic octane ratings—higher than would be available in the marketplace—due to the addition of high-distillate hydrocarbons. And because ethanol affects gasoline distillation in a non-linear fashion, increasing the T50 of ethanol blends to match the T50 of E0 elevated T60-80 distillation temperatures.[6] Higher upper distillation temperatures in the ethanol blends mean that more heat is needed to vaporize fuel components adequately.[7] In turn, higher temperatures generally result in incomplete combustion and greater pollution.[8]

The conclusions from the MOVES2014 for most ethanol blends contradict other emissions test data.[9] In early 2016, a detailed analysis of the MOVES2014 model conducted by scientists from Wyle Laboratories and the Volpe National Transportation Systems Center concluded, "Overall, it was found that the predictive emissions results generated by MOVES2014 for mid-level ethanol blends were sometimes inconsistent with other emissions results from the scientific literature for both exhaust emissions and evaporative emissions…results and trends from MOVES2014 for certain pollutants are often contrary to the findings of other studies and reports in the literature."[10] In particular, the MOVES2014 model predicts that as ethanol content increases, there is a corresponding increase in exhaust emissions of nitrogen components (e.g., nitrogen oxides) and particulate matter, even though real-world

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[5] *See* Coordinating Research Council Report, *supra* note 4, at 47 ("Comparing MOVES2014 fuel property changes to those of California and API blending resources is notably an apples-to-oranges comparison as EPA indicates that the E0 to E10 differences of MOVES are from national refinery modeling and are not reflective of the change in properties from ethanol splash blending.").

[6] *See* Anderson et al., *supra* note 3 at 1031 (discussing impact of unmatched T60-T80 and how it skews results).

[7] *Id*. at 1032.

[8] *See id.* at 1031 ("These comparisons illustrate a potential issue with using single points on the distillation curve as match blending criteria. Higher T60, T70, and T80 values will likely have an adverse impact on tailpipe emissions (similar in magnitude as the T50 and T90 impacts), even though T50 and T90 are the same.").

[9] *See id*. ("Because the occurrence of decreased PM emissions with splash blending of ethanol is particularly well documented, it serves as a good example to illustrate the potential issues with ethanol-gasoline blend studies that use match blending to maintain T50 and T90 (and appear to obtain the opposite result).")

[10] Wayson, R., Kim, B., and Noel, G. January 2016. "Evaluation of Ethanol Fuel Blends in EPA MOVES2014 Model," at 12, available at: https://ethanolrfa.org/wp-content/uploads/2016/01/RFA-MOVES-Report.pdf.

emissions testing using ethanol blends has demonstrated the opposite.[11] "The results from other researchers often show ethanol-related emissions trends that are different than the MOVES2014 results obtained for this study…; In some cases not only were magnitudes different but different [directional] trends were presented."[12]

These likely distortions are then exacerbated by the use of overly restrictive adjustment factors and equations. According to the Wyle and Volpe report, "…the trends used to determine constants in the model's equations may need to consider many more variables than are now being considered," and "the adjustment factor approach may need to be more robust and consider the changes to emissions as a function of all properties, not independently."[13]

In particular, the adjustment factors in the MOVES2014 model do not accurately account for reductions in aromatics contents and T90 temperatures when ethanol is added to gasoline via splash blending. The MOVES2014 model predicts that refiners who modify their gasoline blendstocks to produce E10 instead of E0 reduce summertime and wintertime aromatics content by 2.02% and 3.65%, respectively, and summertime and wintertime T90 by 1.77°F and 2.35°F, respectively.[14] However, EPA's own fuel trends strongly suggest a correlation between higher ethanol blends and lower aromatic content.[15] Average aromatic content dropped from 28.5% to 21.76% between 2000 and 2016.[16] In other words, as E10 use became more widespread, refiners reduced average aromatic content significantly. Indeed, EPA itself states that "[e]thanol's high octane value has also allowed refiners to significantly reduce the aromatic content of the gasoline, a trend borne out in the data."[17]

And, as EPA acknowledged in March 2019, "During the rapid expansion of E10 blending between 2007–2012, aromatics levels were observed to decline by a few volume percent while pump octane levels stayed constant."[18] This is a critical factor because even a small reduction in aromatics results in beneficial impacts to air emissions. EPA's MOVES2014 model continues to falsely predict that aromatics content increases as ethanol content increases, even though EPA's own real-world data shows just the opposite. Yet, even after multiple revisions to the MOVES2014 modeling framework, there is still no evidence that EPA has addressed this issue.

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[11] *See* Anderson et al., *supra* note 3 at 1032-33 ("The addition of these [higher boiling point] hydrocarbons with lower volatility (and poorer fuel vaporization and air-fuel mixing) can reasonably be concluded to be the underlying cause of the increased emissions, including PM, and not the increased ethanol content. However, if the caveat is ignored, the above conclusion may be erroneously interpreted as 'increased ethanol content increases exhaust emissions.' To avoid this confusion, it could be reasonably argued that the EPAct conclusion should instead state 'increased high-boiling-point hydrocarbon content (to compensate for the T50 reduction from increasing ethanol content) increases exhaust emissions.").

[12] Wayson, *supra* note 10, at 58.

[13] *Id*. at 12.

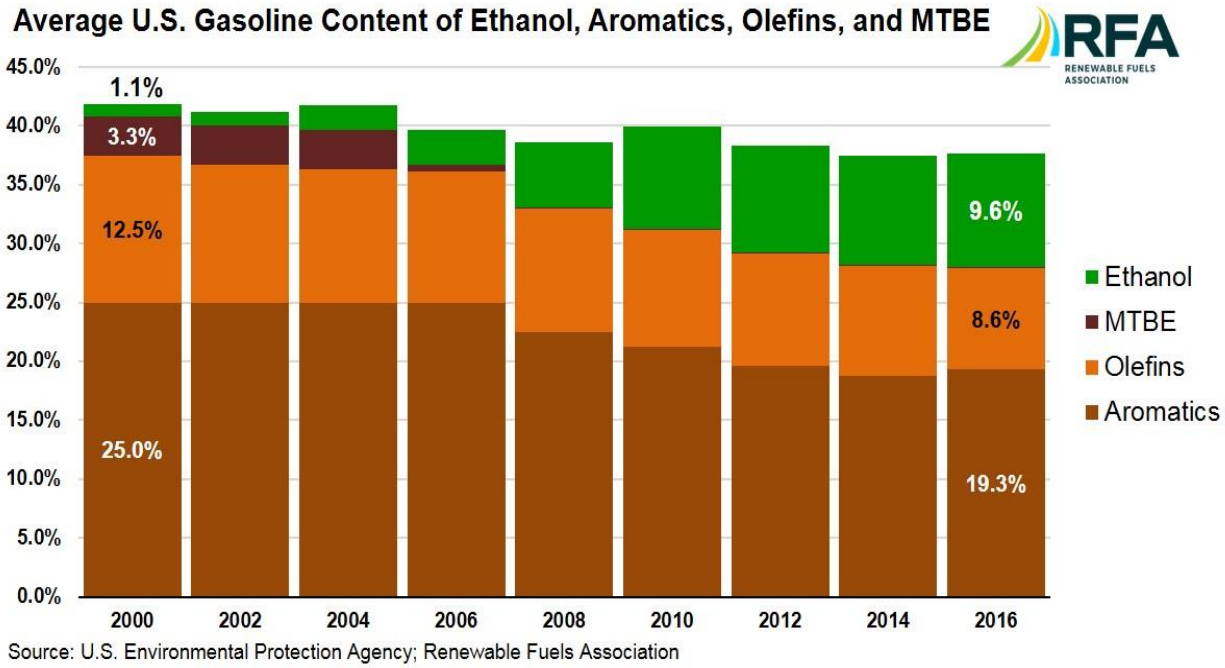
[14] *See* EPA, Fuel Supply Defaults: Regional Fuels and the Fuel Wizard in MOVES2014 11 (Nov. 2016).

[15] EPA Fuel Trends Report: Gasoline 2006 – 2016 26 (Oct. 2017).

[16] *See id*.

[17] *See id.*

[18] 84 Fed. Reg. 10,584, 10,604 (March 21, 2019).



To correct the deficiencies with the MOVES2014 model, the Wyle and Volpe scientists recommend "…additional vehicle exhaust testing from mid-level ethanol blends with well-defined fuel properties."[19] RFA agrees with the conclusions and recommendations of the Wyle/Volpe study and encourages EPA to suspend further usage of the MOVES2014 model until a new emissions study is conducted.

III. EPA'S RELIANCE ON THE MOVES MODEL EMISSIONS DATA DISTORTS THE PICTURE OF ETHANOL'S BENEFITS IN REDUCING CRITERIA POLLUTANTS

For context, it might be useful to note that even with the MOVES2014 flaws noted above, the ABS reflects an improvement in estimated RFS air quality impacts when compared to a similar Air Quality Study completed by the Agency in early 2010 as part of the Regulatory Impact Analysis for the RFS2.[20] In that study, EPA's primary simulation case suggested the RFS would cause increases in all criteria pollutants except CO and some toxics. The 2020 ABS now predicts the RFS has resulted in slightly DECREASED PM10 and PM2.5 emissions and much larger decreases in emissions of CO, benzene, 1,3-butadiene, and naphthalene than the 2009 study. While that improvement is noted and appreciated, the Agency's reliance on its MOVES Model continues to underestimate ethanol's emissions benefits.

For example, with respect to ozone, the ABS suggests the RFS has no impact in much of the country, a benefit in some areas in the northwest, but increases across parts of the southeast. The geographic variability in ozone impacts suggests the affects are unrelated to the RFS and renewable fuels and have far more to do with the emissions profiles of particular airsheds. In the

[19] Wayson et al., *supra* note 10 at 10.

[20] Report No. EPA-420-R-10-006 (February 2010).

absence of actual urban airshed modeling to isolate the impact of renewable fuels, it is not responsible to attempt to estimate or opine on the effect of ethanol or other renewable fuels on ozone pollution. Moreover, urban airshed modeling could properly account for the effect of carbon monoxide on ozone formation. As reaffirmed by the ABS, one of ethanol's most significant impacts on emissions is a dramatic reduction in CO (the ABS suggests the RFS is responsible for a 9% reduction in CO), which the Agency has previously acknowledged is a contributing factor to the formation of ground level ozone. Ignoring the impact of CO reduction, underestimating the reductions in exhaust hydrocarbons, and exaggerating the NOx effect of oxygenates like ethanol,[21] will all lead to a higher estimate of ozone than actually occurs in the real world.

Similarly, the ABS distorted the impact of ethanol on toxics. While acknowledging ethanol yields significant reductions in benzene, 1-3 butadiene, and naphthalene, the ABS noted ethanol results in increased acetaldehyde emissions. But that ignores the relative toxicity benefits associated with ethanol use. Benzene, in particular, is a very dangerous and known carcinogen. 1-3 butadiene is also highly toxic. By comparison, acetaldehyde is a naturally occurring compound that is even produced by the human body. At the concentrations seen in vehicle emissions, acetaldehyde is not generally regarded to be a health threat. EPA's failure to complete a relative toxicity analysis or, at the very least, provide more context regarding the differences in toxicity of various pollutants, appears to be a deliberate effort to mislead.

IV. EPA MUST REVISE ITS MOVES MODEL TO ACCOUNT FOR THE REAL-WORLD BLENDING PROPERTIES OF ETHANOL AND REVISE THE ANTI-BACKSLIDING STUDY ACCORDINGLY

Short of a new study, RFA has identified two ways in which EPA could increase the accuracy of its MOVES model. First, EPA could apply larger ethanol adjustment factors for aromatics and T90 to account for how MOVES2014 currently understates the potential impact of E10 on refinery operations.[22] Second, as an initial step toward improving the MOVES2014b model's treatment of ethanol blends, EPA should modify the model to include the T70 parameter as an explanatory variable in analysis of fuel effects on PM emissions as recommended by Darlington *et al*.[23] In a recent *Society of Automotive Engineers* technical paper, this group of fuel

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[21] The ABS projects increased NOx emissions attributable to the RFS, but more recent data has concluded NOx emissions from gasoline vehicles are highly dependent upon vehicle technology and may be unrelated, or only weakly related, to fuel type. Also, some studies show NOx emissions may be marginally decreased as ethanol content increases. *See* Renewable Fuels Association and Growth Energy, "California Multimedia Evaluation of Gasoline-Ethanol Blends between E10 and E30 Tier I Report" Comments to California Air Resources Board (Feb. 14, 2019) at 45 ("None of the E15 studies, whether done on California fuels or other US fuels found a statistically significant increase in any criteria pollutant. NOx, CO, PM mass emissions, or organic emissions (NMOG, THC, or NMHC depending on the study) were measured. Statistically significant decreases were found for NMHC, CO and potency weighted toxics, and a marginally significant decrease in NOx emissions due to changes in ethanol content in the fuel.").

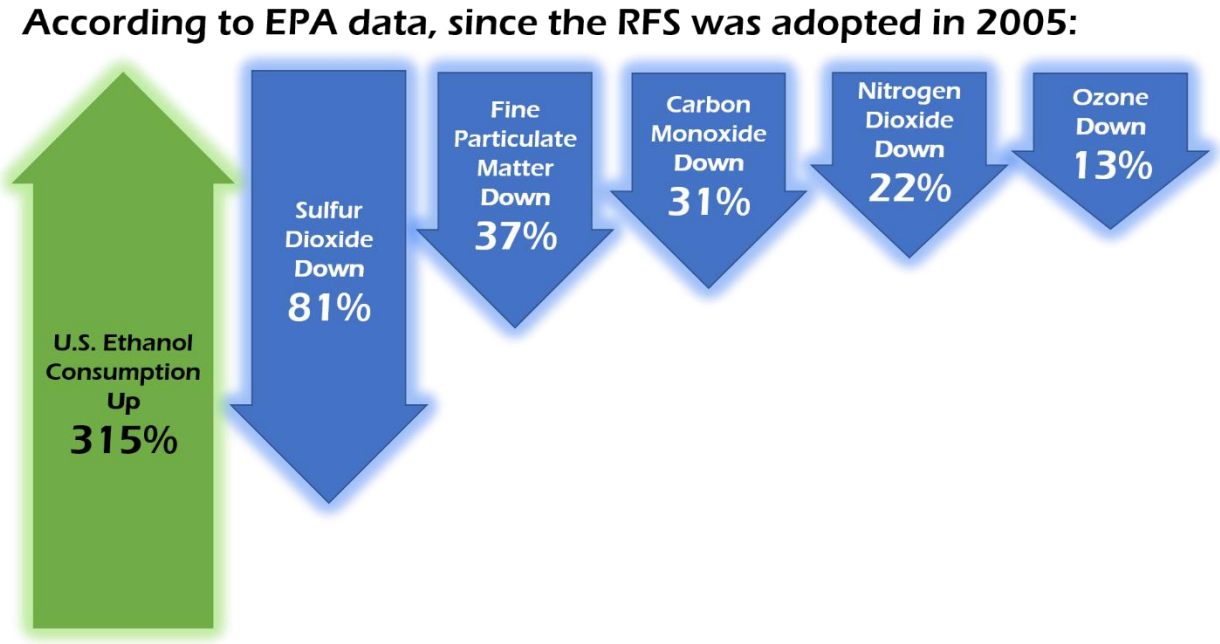
[22] *See* Comments of Urban Air Initiative (March 25, 2019), Appendix B: "Impact of Ethanol Blending on Aromatics and T90" at 4, Docket No. EPA-HQ-OGC-2018-0818.

[23] Darlington, T., Kahlbaum, D., Van Hulzen, S., and Furey, R. "Analysis of EPAct Emission Data Using T70 as Additional Predictor of PM Emissions from Tier 2 Gasoline Vehicles," SAE Technical Paper 2016-01-0996, 2016, available at https://doi.org/10.4271/2016-01-0996.

experts and automotive engineers presented an alternative model that adds T70 as an explanatory variable, finding that "…if T70 is added to the Bag 1 EPAct model and used in EPA's MOVES2014 emission inventory model, increased ethanol levels beyond E10 are predicted to reduce PM from on-road motor vehicles in the U.S."[24] If EPA does not make these adjustments, then at the very least, EPA should limit the MOVES2014 ethanol variable to 10 percent to preclude inaccurate comparisons between fuels with different levels of ethanol.

V. An Assessment of Real-World Data Demonstrates the Air Quality Efficacy of Ethanol Blended Fuels

Unfortunately, the ABS fails to provide meaningful context about real-world emissions trends during the period of RFS implementation. As shown in the chart below, since the RFS was adopted in 2005, EPA data from air monitors show that carbon monoxide concentrations are down 31%, nitrogen dioxide is down 22%, ozone is down 13%, fine particulate matter is down 37%, and sulfur dioxide is down 81%. The levels of all these pollutants have now fallen below the national standard.



Of course, many factors have contributed to these emissions reductions. But the fact that criteria pollutants have fallen considerably during the period of RFS implementation is inarguable. The emissions trends strongly suggest that increased use of ethanol (which led to a simultaneous reduction in the use of aromatics and olefins) has played an important role in reducing air pollution. Frankly, this chart is all that is necessary for EPA to report on changes in air quality during the period of rapid growth in ethanol blending under the RFS program. There has been NO backsliding. There has only been significant air quality improvement. Moreover, while the ABS is silent on the greenhouse gas benefits of ethanol and the RFS, those too need to

[24] *Id.*

be appreciated in any comprehensive assessment of the environmental impact of the RFS program. The RFS has been an important policy for reducing greenhouse gas emissions from transportation for 15 years. Since its inception, the RFS program has reduced CO2-equivalent GHGs by an astounding 600 million metric tons, according to Life Cycle Associates. That is equivalent to removing roughly half of the cars on the road in America for an entire year or eliminating the annual emissions from 13 coal-fired power plants.

In conclusion, the RFA strongly believes the air quality benefits of ethanol and the RFS are profound, particularly when properly contrasted with the environmental consequences of the continued reliance on crude oil for transportation fuels. While the ABS reflects some of those benefits and arrives at the proper conclusion that any further "mitigation" strategies are unwarranted, it does not provide a clear or accurate reflection of ethanol's air quality benefits. We would welcome the opportunity to work constructively with the Agency to complete a more meaningful assessment of ethanol's air quality impacts.

Thank you for the opportunity to comment. RFA appreciates your consideration.

Sincerely,

Geoff Cooper
President & CEO