OZONE TRANSPORT COMMISSION

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April 29, 2024

Alejandra Nuñez
Deputy Assistant Administrator for Mobile Sources
Office of Air and Radiation
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Delivered via email

Dear Deputy Assistant Administrator Nuñez:

The Ozone Transport Commission (OTC) respectfully requests that the U.S. Environmental Protection Agency (EPA) review existing research on mobile source air pollutant emissions from biodiesel fuel combustion in modern diesel engines and update its emissions modeling tools, where needed, based upon its research review. The OTC is highly concerned EPA's modeling tools used to evaluate biodiesel emission changes relative to conventional ultra-low sulfur diesel (ULSD) do not fully reflect the impact of biodiesel on emissions from engines equipped with exhaust aftertreatment technologies. States and others rely on these EPA tools to develop emissions inventories in support of long-term air quality planning efforts and to prioritize the most promising pollution reduction projects when seeking grant funding. If biodiesel use in diesel vehicles increases ozone forming pollution and photochemical grid models do not reflect this, then state efforts to attain the ozone NAAQS are being undermined.

Background

In 2006, EPA lowered the highway diesel sulfur standard from 500 pm to 15 ppm in all of the United States except Alaska. Diesel exhaust from on-road vehicles is responsible for 20% of the nitrogen oxides (NOx) in the OTC states' emissions inventories, which contributes up to 7% of the ozone measured at monitors in the OTC not meeting the current ground-level ozone health standards.[1] The removal of most sulfur from highway diesel led to decreased particulate matter (PM) due to reduced production of sulfates as well as decreased NOx and direct PM emissions due to use of advanced exhaust aftertreatment technologies afforded by the use of ULSD.

[1] Data from source apportionment modeling conducted by the OTC Modeling Committee using the 2016v1 emissions platform (unpublished results).

For pre-2007 model year engines, EPA last analyzed the change in emissions resulting from using biodiesel blends in 2010.[2] EPA found decreases in PM, hydrocarbons (HC), and carbon monoxide (CO) of 15.6%, 13.8%, and 14.1%, respectively, and an increase in NOx of 2.2% in engines using a biodiesel blend of 20%. EPA did not analyze the change in emissions resulting from the use of biodiesel blends in 2007 and later model year diesel engines but relied on two studies published in 2011 to conclude that a biodiesel blend of 20% used in model year 2007 and newer engines results in no emissions change as compared to diesel engines running on ULSD.[3,4]

A 2021 literature review conducted by the International Council on Clean Transportation (ICCT) investigated whether replacing ULSD with biodiesel still reduced emissions from modern diesel engines.[5] This comprehensive literature review found that replacing ULSD with biodiesel blends in engines with modern aftertreatment systems increases NOx and volatile organic compound (VOC) emissions by 4% and 7%, respectively, and has no PM benefits. As such, the OTC believes there is sufficient evidence that switching from ULSD to biodiesel blends can increase ozone precursor pollutant emissions of NOx and possibly VOCs.

Air Quality and Public Health Impacts

NOx is the primary precursor responsible for elevated regional ozone pollution levels. The negative health impacts of exposure to ozone pollution in the OTC states and elsewhere are clear. It worsens asthma and other cardio-respiratory illnesses, especially in children and older adults, leading to additional trips to doctors and emergency rooms, and missed days of school and work. Elevated ozone exposure also increases the risk of premature death.

Study and Next Steps

Based on the initial findings of the ICCT report, the OTC requests EPA conduct a research review on biodiesel combustion emissions in modern advanced technology diesel engines, i.e., engines equipped with exhaust aftertreatment technologies facilitated by ULSD. If confirmed by its research review, EPA should revise its modeling tools to reflect the most up-to-date emissions information on diesel engines using biodiesel blends. EPA should also immediately consider ceasing to fund biodiesel retrofits under programs such as the Diesel Emissions Reduction Act (DERA). Likewise, EPA should work with the U.S. Department of Transportation (US DOT) to cease funding of biodiesel retrofits under programs such as the Congestion Mitigation and Air Quality (CMAQ) Program.

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[2] US EPA. "Renewable Fuel Standard Program (RFS 2): Regulatory Impact Analysis." EPA-420-R-10-006, February 2010.

[3] Durbin, T., J. Miller, K. Johnson, M. Hajbabaei, N. Kado, R. Kobayashi, C. Vogel, F. Matsumura, P. Wong, and T. Cahill (2011). "Final Report for the CE-CERT Engine Testing Portion for the CARB Assessment of the Emissions from the Use of Biodiesel as a Motor Vehicle Fuel in California Biodiesel Characterization and NOx Mitigation Study." Final Report Prepared for CARB.

[4] McCormick, R. and Williams, A. (2011). "Impact of Biodiesel on Modern Diesel Engine Emissions." Project ID: FT011. National Renewable Energy Laboratory, Golden, CO. May 9, 2011, Impact of Biodiesel on Modern Diesel Engine Emissions (energy.gov).

[5] O'Malley, J. and Searle, S. (2021). "Air Quality Impacts of Biodiesel in the United States." International Council on Clean Transportation, https://theicct.org/wp-content/uploads/2021/06/US-biodiesel-impacts-mar2021.pdf.

In addition to the literature cited by the ICCT review paper,[5] we suggest the following as examples of relevant literature published since EPA's 2010 "Renewable Fuel Standard Program (RFS 2): Regulatory Impact Analysis."[2]

- Alam, S. S., Churkunti, P. R., & Depcik, C. (2022). Comparison of waste plastic fuel, waste cooking oil biodiesel, and ultra-low sulfur diesel using a Well-to-Exhaust framework. *International Journal of Environmental Science and Technology*, *19*(7), 5857-5876. https://doi.org/10.1007/s13762-021-03552-3
- Bugarski, A. D., Janisko, S. J., Cauda, E. G., Patts, L. D., Hummer, J. A., Westover, C., & Terrillion, T. (2014). Aerosols and criteria gases in an underground mine that uses FAME biodiesel blends. *Annals of occupational hygiene*, *58*(8), 971-982. https://doi.org/10.1093/annhyg/meu049
- Gysel, N., Karavalakis, G., Durbin, T., Schmitz, D., & Cho, A. (2014). *Emissions and redox activity of biodiesel blends obtained from different feedstocks from a heavy-duty vehicle equipped with DPF/SCR aftertreatment and a heavy-duty vehicle without control aftertreatment* (No. 2014-01-1400). SAE Technical Paper. https://doi.org/10.4271/2014-01-1400
- Pollitt, K. J. G., Chhan, D., Rais, K., Pan, K., & Wallace, J. S. (2019). Biodiesel fuels: A greener diesel? A review from a health perspective. *Science of the total environment*, *688*, 1036-1055. https://doi.org/10.1016/j.scitotenv.2019.06.002
- Sharp, C.A. (2023). *Characterization of Fuel Impacts on Heavy-Duty Low NOx Engine Emissions*, Southwest Research Institute for Coordinating Research Council (CRC Report No. RW-120). https://crcao.org/wp-content/uploads/2023/08/CRC-RW-120-SwRI-FinalReport-8.9.23.pdf
- Walkowicz, K., Na, K., Robertson, W., Sahay, K., Bogdanoff, M., Weaver, C., & Carlson, R. (2010). *On-Road and In-Laboratory Testing to Demonstrate Effects of ULSD, B20 and B99 on a Retrofit Urea-SCR Aftertreatment System* (Vol. 1, No. NREL/CP-540-46533). National Renewable Energy Lab.(NREL), Golden, CO (United States). https://www.nrel.gov/docs/fy10osti/46533.pdf

Conclusion

The OTC is highly concerned that the EPA modeling tools used to evaluate biodiesel emission changes relative to ULSD do not fully reflect the impact of biodiesel on emissions. States and others rely on these EPA tools to develop emissions inventories in support of long-term air quality planning efforts and to prioritize the most promising pollution reduction projects when seeking grant funding. EPA tools are also used in quantifying air pollution co-benefits of greenhouse gas reduction strategies under Climate Pollution Reduction Grants (CPRGs) and other climate policies and programs. Out-dated tools can overestimate the emission reduction potential of biodiesel technologies, thus diverting resources from other options, like zero-emission technologies, into measures that are less effective in protecting the public's health and the environment.

Thank you for your consideration of our request, and please feel free to reach out to the OTC's mobile sources staff lead Coralie Cooper (ccooper@nescaum.org) if you have any questions.

Sincerely,

Paul E. Farrell
Chair, OTC Mobile Sources Committee
Director, Planning & Standards Division, Bureau or Air Management
Connecticut Department of Energy and Environmental Protection

cc: OTC Directors
Megan Beardsley, EPA OTAQ