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August 30, 2022

Kevin Allen
Associate Director
Arizona Department of Agriculture
Weights and Measures Services Division
1802 W. Jackson St., #78
Phoenix, AZ 85007
Submitted via email: kallen@azda.gov

RE: POET Comments on Proposed WMSD E15 Rule, RS-7

Dear Mr. Allen,

POET appreciates the opportunity to provide comments in response to the Arizona Department of Agriculture Weights and Measures Services Division's (WMSD) Notice of Proposed Rulemaking for the Arizona Administrative Code, Title 3, Chapter 7.[1] The proposed regulations would allow for the sale of E15 throughout the state, improve clarity, and reduce burdens for the regulated community. POET strongly supports this proposed regulation and the sale of E15 throughout Arizona. The following comments in support of this rulemaking show that Arizona can easily allow for E15 without burdening consumers or the regulated community and discusses the significant air quality benefits of E15.

About POET

POET's vision is to create a world in sync with nature. As the world's largest producer of biofuels and a global leader in sustainable bioproducts, POET creates plant-based alternatives to fossil fuels that utilize the power of agriculture and cultivate opportunities for America's farm families. Founded in 1987 and headquartered in Sioux Falls, POET operates 33 bioprocessing facilities across eight states and employs more than 2,200 team members. With a suite of bioproducts including Dakota Gold and NexPro feed, Voilà corn oil, purified alcohol, renewable CO_2 and JIVE asphalt rejuvenator, POET is committed to innovation and advancing solutions to some of the world's most pressing challenges. POET holds more than 80 patents and continues to break new ground in biotechnology, yielding ever-cleaner and more efficient renewable energy. In 2021, POET released its inaugural Sustainability Report pledging carbon neutrality by 2050.

[1] A.A.R. Vol. 28, Issue 29 pg. 1683 (July 2022).

Proposed Regulation

POET supports this proposed regulation, which would allow E15 motor fuel as an additional option for consumers within the Clean Burning Gasoline (CBG) area in Arizona by removing low Reid Vapor Pressure (RVP) gasoline requirements. This proposed regulation also establishes standards for blending and the certification of E15 for sale in the CBG area.

E15 is offered at more than 2,600 retail locations across 31 states. Apart from Arizona, only California and Montana fail to allow for the sale of E15, and California is currently evaluating the benefits of modifying the state's fuel specifications to allow for the sale of E15.[2] More retailers across the U.S. are finding that E15 boosts sales and attracts loyal customers.[3] Still, some may be surprised to learn that much of the existing fuel infrastructure is, in fact, E15 already compatible. According to reports by the National Renewable Energy Laboratory,[4] U.S. Department of Energy,[5] U.S. Environmental Protection Agency, [6] Steel Tank Institute,[7] and Fiberglass Tank and Pipe Institute,[8] most underground storage tanks made in the last 30 years are approved for up to 100% ethanol, and most fuel dispensing equipment is already manufacturer-approved for E15. In fact, since the 1980s petroleum equipment manufacturers have offered compatible products for blends above 10% ethanol, including storage tanks, piping, valves, hanging hardware, dispensers, hoses, and nozzles, as standard equipment.[9]

Additionally, transitioning vehicles from E10 to E15 will not result in a loss in vehicle performance. The U.S. Department of Energy's (DOE) Oak Ridge Laboratory data "showed no statistically significant loss of vehicle performance (emissions, fuel economy, and maintenance issues) attributable to the use of E15 fuel compared to straight gasoline."[10] Additionally, studies from the University of California, Riverside have shown that fuel economy with E15 could rise

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[2] *Fuels Multimedia Evaluation of E15*, CARB (June 2020), https://ww2.arb.ca.gov/resources/documents/fuels-multimedia-evaluation-e15.

[3] *Demand for Unleaded 88 (E15) Sees Continued Growth—Even Amid the Pandemic*, CSP, (Dec. 2020), https://www.cspdailynews.com/fuels/demand-unleaded-88-e15-sees-continued-growth-even-amid-pandemic.

[4] Moriarty, K., Yanowitz, J., *E15 and Infrastructure*, NREL (2015), https://afdc.energy.gov/files/u/publication/e15_infrastructure.pdf.

[5] *Handbook for Handling, Storing, and Dispensing E85 and Other Ethanol-Gasoline Blends*, U.S. DEPARTMENT OF ENERGY (Feb. 2016), https://afdc.energy.gov/files/u/publication/ethanol_handbook.pdf.

[6] *See E15 Fuel Dispenser Labeling and Compatibility with Underground Storage Tanks*, 86 FR 5094, EPA (Jan. 2021), https://www.epa.gov/ust/proposed-rulemaking-e15-fuel-dispenser-labeling-and-compatibility-underground-storage-tanks.

[7] *Alternative Fuels, Fuels Compatibility Statement*, STI/SPFA (last visited Aug. 2022), https://www.steeltank.com/FabricatedSteelProducts/ShopFabricatedTanks/AlternativeFuels/tabid/790/Default.aspx.

[8] Curran, Sullivan, E*thanol Compatibility with Fiberglass UST Systems*, FIBERGLASS TANK &PIPELINE INSTITUTE (Jan. 2015), http://www.fiberglasstankandpipe.com/wp-content/uploads/2018/11/Ethanol-Compatibility-with-Fiberglass-11102016-retired..pdf.

[9] *UST Component Compatibility Library*, PEI (last visited Aug. 2022), https://pei.org/resources/ust-component-compatibility-library/.

[10] West, Brian, *et al*., *Intermediate Ethanol Blends Catalyst Durability Program*, OAK RIDGE NATIONAL LABORATORY (Feb. 2012), https://info.ornl.gov/sites/publications/files/Pub31271.pdf.

by upwards of 6% taking realistic driving conditions into account, and under worst case scenario decrease by only 1%.[11]

E15 Reduces Gas Prices

E15 reliably means significant savings at the pump.[12] As oil prices have surged around the world, higher blends of ethanol have offered a lower-cost, lower-emission option for hardworking families across America. In recent months, E15 has delivered savings approaching $1 per gallon in some areas of the country.

Shifting standard gasoline blends from 10% ethanol to 15% ethanol is projected to generate $12.2 billion in savings for US consumers at the pump each year.[13] America's bioethanol producers can also easily meet the increased demand that E15 sales in Arizona would create, as there is currently excess capacity that can be used to fill the demand.

Bioethanol Air Toxics Emissions Reductions

Higher bioethanol blends like E15 result in significant air toxics reductions. Recent studies show that bioethanol provides a pathway to reduce harmful air pollutants such as total hydrocarbons (THCs), carbon monoxide compounds, $PM_{2.5}$,[14] and BTEX. Additionally, bioethanol either slightly reduces or does not contribute to NOx emissions.

An analysis from leading national experts demonstrates air quality and public health benefits from higher biofuel blends.[15] The study is the first large-scale analysis of data from light-duty vehicle emissions that examines real-world impacts of ethanol-blended fuels on regulated air pollutant emissions, including particulate matter (PM), carbon monoxide (CO), NOx, and THCs. The study found that CO and THC emissions were significantly lower for higher ethanol fuels for port fuel injected engines under cold-start conditions. THCs include VOCs, meaning that both primary ozone precursors decreased with higher ethanol blends. The study found no statistically significant relationship between higher ethanol blends and NOx emissions.

Another recent analysis builds on that work, demonstrates ethanol-associated reductions in emissions of primary PM, CO, and THCs, and shows that health benefits from ethanol should apply to disadvantaged communities in particular.[16] Key findings of the study include:

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[11] Yang, Jiacheng, *et al.*, *Impacts of gasoline aromatic and ethanol levels on the emissions from GDI vehicles: Part 1. Influence on regulated and gaseous toxic pollutants,* SCIENCE DIRECT, VOL. 252 (Sep. 2019), https://www.sciencedirect.com/science/article/abs/pii/S0016236119307094.

[12] *E15 Savings Cross the U.S.*, GROWTH ENERGY (2022), https://growthenergy.org/wp-content/uploads/2022/06/6.27.22-Gas-Prices.pdf.

[13] *E15 Value: Fuel Economy & Savings*, GROWTH ENERGY (2022), https://growthenergy.org/wp-content/uploads/2022/07/GROW-22054-Ethanol-Fuel-Economy-2022-07-21.pdf.

[14] Kazemiparkouhi, Fatemeh *et al., Comprehensive US Database and Model for Ethanol Blend Effects on Regulated Tailpipe Emissions*, Atmospheric Environment, (Aug. 2022) https://www.sciencedirect.com/science/article/pii/S2590162122000399.

[15] *See id*.

[16] *See* Attachment A, Tufts University Department of Civil and Environmental Engineering, *Air Quality and Public Health Comments to RFS*, February 3, 2022.

- PM emissions decreased with increasing ethanol content under cold-start conditions. Primary PM emissions decreased by 15-19 percent on average for each 10 percent increase in ethanol content under cold-start conditions. Cold start PM emissions have consistently been shown to account for a substantial portion of all direct tailpipe PM emissions from motor vehicles. Lower PM emissions result in lower ambient PM concentrations and exposures, which, in turn, are causally associated with lower risks of total mortality and cardiovascular effects.
- Emissions of CO and THC generally decreased with increasing ethanol fuel content under cold running conditions, while NOx emissions did not change.
- Air toxic emissions showed lower BTEX, 1-3 butadiene, black carbon, and particle number emissions with increasing ethanol content in market fuels.
- Higher blends of ethanol fuels may be particularly beneficial for disadvantaged communities that have high traffic density and congestion and are thus exposed to disproportionately higher concentrations of PM emitted from motor vehicle tailpipes. Vehicle trips within these communities tend to be short in duration and distance, with approximately 50% of all trips in dense urban communities under three miles long. As a result, a large proportion of these vehicle trips occur under cold start conditions when PM emissions are highest.

The air quality benefits demonstrated in these studies show that biofuel can play a key role in helping Arizona achieve federal and state air quality standards.

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POET strongly supports this Arizona Department of Agriculture WMSD proposed regulation. We appreciate WMSD's consideration of these comments and look forward to engaging in a productive dialogue with the Agency on E15 and the role biofuels play in helping Arizona achieve its air quality goals. If you have any questions, please contact me at Matt.Haynie@POET.COM or (202) 756-5604.

Sincerely,

Matthew Haynie
Senior Regulatory Counsel
POET, LLC

Attachment A

Tufts University | School of Engineering

Department of Civil and Environmental Engineering

February 3, 2022

Docket Number: EPA-HQ-OAR-2021-0324

Comments of Drs. Fatemeh Kazemiparkouhi,[1] David MacIntosh,[2] Helen Suh[3]
[1] Environmental Health & Engineering, Inc., Newton, MA
[2] Environmental Health & Engineering, Inc., Newton, MA and the Harvard T.H. Chan School of Public Health, Boston, MA
[3] Tufts University, Medford, MA

We are writing to comment on issues raised by the proposed RFS annual rule, the Draft Regulatory Impact Analysis (December 2021; EPA-420-D-21-002), and the supporting Health Effects Docket Memo (September 21, 2021; EPA-HQ-OAR-2021-0324-0124), specifically regarding the impact of ethanol-blended fuels on air quality and public health. We provide evidence of the air quality and public health benefits provided by higher ethanol blends, as shown in our recently published study[1] by Kazemiparkouhi et al. (2021), which characterized emissions from light duty vehicles for market-based fuels. Findings from our study demonstrate ethanol-associated reductions in emissions of primary particulate matter (PM), nitrogen oxides (NOx), carbon monoxide (CO), and to a lesser extent total hydrocarbons (THC). Our results provide further evidence of the potential for ethanol-blended fuels to improve air quality and public health, particularly for environmental justice communities. Below we present RFS-pertinent findings from Kazemiparkouhi et al. (2021), followed by their implications for air quality, health, and environmental justice.

Summary of Kazemiparkouhi et al. (2021)

Our paper is the first large-scale analysis of data from light-duty vehicle emissions studies to examine real-world impacts of ethanol-blended fuels on regulated air pollutant emissions, including PM, NOx, CO, and THC. To do so, we extracted data from a comprehensive set of emissions and market fuel studies conducted in the US. Using these data, we (1) estimated composition of market fuels for different ethanol volumes and (2) developed regression models to estimate the impact of changes in ethanol volumes in market fuels on air pollutant emissions for different engine types and operating conditions. Importantly, our models estimated these changes accounting for not only ethanol volume fraction, but also aromatics volume fraction, 90% volume distillation temperature (T90) and Reid Vapor Pressure (RVP). Further, they did so

[1] https://doi.org/10.1016/j.scitotenv.2021.151426

under both cold start and hot stabilized running conditions and for gasoline-direct injection engines (GDI) and port-fuel injection (PFI) engine types. Key highlights from our paper include:

- ***Aromatic levels in market fuels decreased by approximately 7% by volume for each 10% by volume increase in ethanol content*** (Table 1)**.** Our findings of lower aromatic content with increasing ethanol content is consistent with market fuel studies by EPA and others (Eastern Research Group, 2017, Eastern Research Group, 2020, US EPA, 2017). As discussed in EPA's Fuel Trends Report, for example, ethanol volume in market fuels increased by approximately 9.4% between 2006 and 2016, while aromatics over the same time period were found to drop by 5.7% (US EPA, 2017).

  We note that our estimated market fuel properties differ from those used in the recent US EPA Anti-Backsliding Study (ABS), which examined the impacts of changes in vehicle and engine emissions from ethanol-blended fuels on air quality (US EPA, 2020). Contrary to our study, ABS was based on hypothetical fuels that were intended to satisfy experimental considerations rather than mimic real-world fuels. It did not consider published fuel trends; rather, the ABS used inaccurate fuel property adjustment factors in its modeling, reducing aromatics by only 2% (Table 5.3 of ABS 2020), substantially lower than the reductions found in our paper and in fuel survey data (Kazemiparkouhi et al., 2021, US EPA, 2017). As a result, the ABS's findings and their extension to public health impacts are not generalizable to real world conditions.

Table 1. Estimated market fuel properties

Fuel ID	EtOH Vol (%)	T50 (^oF)	T90 (^oF)	Aromatics Vol (%)	AKI	RVP (psi)
E0	0	219	325	30	87	8.6
E10	10	192	320	22	87	8.6
E15	15	162	316	19	87	8.6
E20	20	165	314	15	87	8.6
E30	30	167	310	8	87	8.6

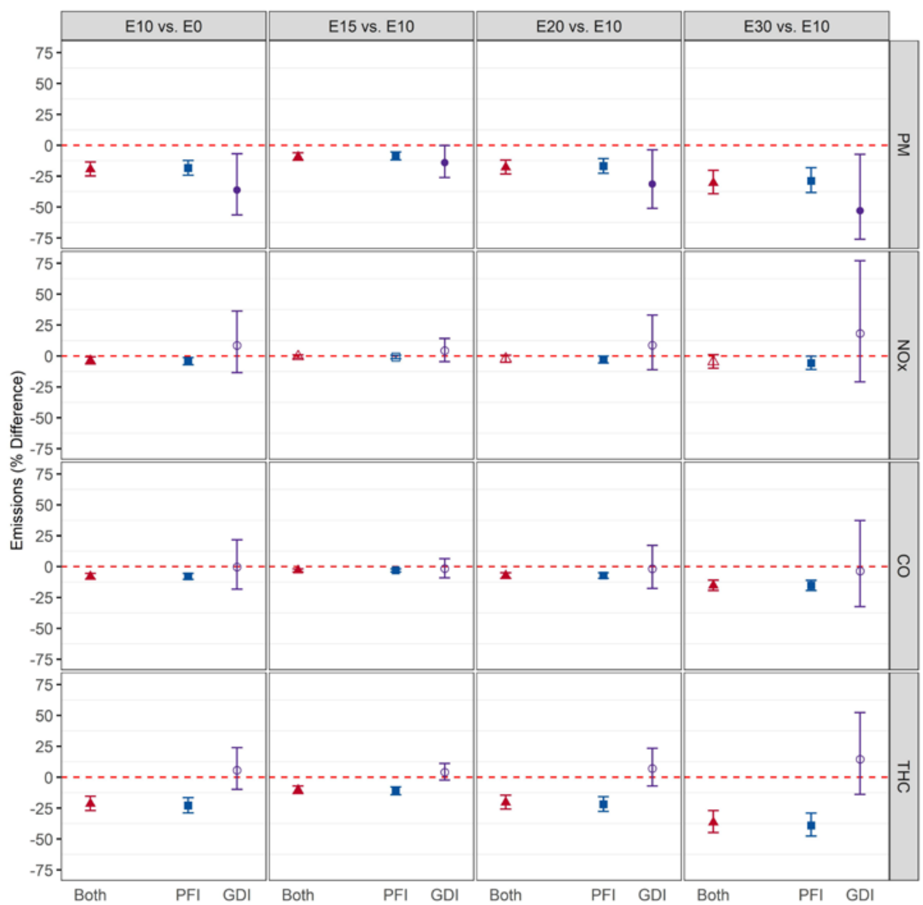
Abbreviations: EtOH = ethanol volume; T50 = 50% volume distillation temperature; T90 = 90% volume distillation temperature; Aromatics=aromatic volume; AKI = Anti-knock Index; RVP = Reid Vapor Pressure.

- ***PM emissions decreased with increasing ethanol content under cold-start conditions.*** Primary PM emissions decreased by 15-19% on average for each 10% increase in ethanol content under cold-start conditions (Figure 1). While statistically significant for both engine types, PM emission reductions were larger for GDI as compared to PFI engines, with 53% and 29% lower PM emissions, respectively, when these engines burned E30 as compared to E10. In contrast, ethanol content in market fuels had no association with PM emissions during hot-running conditions.

  Importantly, our findings are consistent with recent studies that examined the effect of ethanol blending on light duty vehicle PM emissions. Karavalakis et al. (2014), (2015), Yang et al. (2019a), (2019b), Schuchmann and Crawford (2019), for example, assessed the influence of different mid-level ethanol blends – with proper adjustment for aromatics – on the PM emissions from GDI engines and Jimenez and Buckingham (2014) from PFI engines. As in our study, which also adjusted for aromatics, each of these recent studies found higher ethanol blends to emit lower PM as compared to lower or zero ethanol fuels.

Together with these previous studies, our findings support the ability of ethanol-blended fuels to offer important PM emission reduction opportunities. **Cold start PM emissions have consistently been shown to account for a substantial portion of all direct tailpipe PM emissions from motor vehicles**, with data from the EPAct study estimating this portion to equal 42% (Darlington et al., 2016, US EPA, 2013). The cold start contribution to total PM vehicle emissions, together with our findings of emission reductions during cold starts, suggest that a **10% increase in ethanol fuel content from E10 to E20 would reduce total tailpipe PM emissions from motor vehicles by 6-8%.**

Figure 1. Change (%) in cold-start emissions for comparisons of different ethanol-content market fuels[a]



[a] Emissions were predicted from regression models that included ethanol and aromatics volume fraction, T90, and RVP as independent variables

- **NOx, CO and THC emissions were significantly lower for higher ethanol fuels for PFI engines under cold-start conditions**, but showed no association for GDI engines (Figure 1). CO and THC emissions also decreased under hot running conditions for PFI and for CO also for GDI engines (results not shown). [Note that NOx emissions for both PFI and GDI engines were statistically similar for comparisons of all ethanol fuels, as were THC emissions for GDI engines.] These findings add to the scientific evidence demonstrating emission reduction benefits of ethanol fuels for PM and other key motor vehicle-related gaseous pollutants.

Implications for Public Health and Environmental Justice Communities

The estimated reductions in air pollutant emissions, particularly of PM and NOx, indicate that increasing ethanol content offers opportunities to improve air quality and public health. As has been shown in numerous studies, lower PM emissions result in lower ambient PM concentrations and exposures (Kheirbek et al., 2016, Pan et al., 2019), which, in turn, are causally associated with lower risks of total mortality and cardiovascular effects (Laden et al., 2006, Pun et al., 2017, US EPA, 2019, Wang et al., 2020).

The above benefits to air quality and public health associated with higher ethanol fuels may be particularly great for environmental justice (EJ) communities. EJ communities are predominantly located in urban neighborhoods with high traffic density and congestion and are thus exposed to disproportionately higher concentrations of PM emitted from motor vehicle tailpipes (Bell and Ebisu, 2012, Clark et al., 2014, Tian et al., 2013). Further, vehicle trips within urban EJ communities tend to be short in duration and distance, with approximately 50% of all trips in dense urban communities under three miles long (de Nazelle et al., 2010, Reiter and Kockelman, 2016, US DOT, 2010). As a result, a large proportion of urban vehicle trips occur under cold start conditions (de Nazelle et al., 2010), when PM emissions are highest. Given the evidence that ethanol-blended fuels substantially reduce PM, NOx, CO, and THC emissions during cold-start conditions, it follows that ethanol-blended fuels may represent an effective method to reduce PM health risks for EJ communities.

Summary

Findings from Kazemiparkouhi et al. (2021) provide important, new evidence of ethanol-related reductions in vehicular emissions of PM, NOx, CO, and THC based on real-world fuels and cold-start conditions. Given the substantial magnitude of these reductions and their potential to improve air quality and through this public health, our findings warrant careful consideration. Policies that encourage higher concentrations of ethanol in gasoline would provide this additional benefit. These policies are especially needed to protect the health of EJ communities, who experience higher exposures to motor vehicle pollution, likely including emissions from cold starts in particular, and are at greatest risk from their effects.

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