Comments of

URBAN AIR INITIATIVE; BIG RIVER RESOURCES, LLC; BIG RIVER UNITED ENERGY, LLC; LITTLE SIOUX CORN PROCESSORS, LLC; MIDWEST AGENERGY; PRAIRIE HORIZON AGRI ENERGY; RED TRAIL ENERGY, LLC; SIOUXLAND ETHANOL; THARALDSON ETHANOL; FAGEN, INC.

On the National Highway Traffic Safety Administration and U.S. Environmental Protection Agency's Proposed

SAFER AFFORDABLE FUEL-EFFICIENT (SAFE) VEHICLES RULE FOR MODEL YEARS 2021-2026 PASSENGER CARS AND LIGHT TRUCKS

Docket ID No. NHTSA-2018-0067; EPA-HQ-OAR-2018-0283

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EXECUTIVE SUMMARY

High-octane midlevel ethanol blends would enable more efficient vehicles, reduce carbon dioxide emissions, and reduce particle pollution that threatens public health. Automakers and scientists at the Department of Energy have demonstrated that high-octane midlevel ethanol blends would enable higher compression ratios and more efficient vehicle operation. In these vehicles, the use of high-octane midlevel ethanol blends would reduce tailpipe carbon dioxide emissions by an estimated 5 to 10% and could even increase real world fuel economy. High-octane midlevel ethanol blends would also dilute gasoline aromatic hydrocarbons, which contribute to particle pollution that threatens human health.

Unnecessary regulatory barriers impede the widespread sale of high-octane midlevel ethanol blends and the corresponding development of more efficient engines. To allow these blends to compete in the market, EPA must:

(A) Approve a midlevel ethanol certification fuel and revise test fuel rules that inhibit auto manufacturers from applying for a new certification fuel;

(B) Correct its inaccurate fuel economy calculation to eliminate its bias against gasoline test fuels with greater ethanol content;

(C) Update its obsolete interpretation of the Clean Air Act's "sub-sim law," § 211(f), to remove an illegal regulatory barrier to higher concentrations of ethanol in existing vehicles;

(D) Expedite its rule to rationalize the RVP standard for blends above E10, as the President has directed.

To remove market impediments to the introduction of high-compression engines, EPA could also use its authority under the Clean Air Act, § 211(c), to phase out low-octane gasoline that prevents the auto industry from raising compression ratios nationwide and degrades vehicle performance, increasing carbon dioxide emissions.

The agencies are correct that California's electric-vehicle mandate is preempted by federal law. The mandate conflicts with federal law because it lowers average fuel economy and because it stands as an obstacle to Congress's objective of encouraging a range of alternative fuel technologies.

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INTRODUCTION

I. URBAN AIR INITIATIVE'S INTEREST IN THE PROPOSED RULE.

Urban Air Initiative (UAI) is a non-profit organization dedicated to improving air quality and protecting public health by reducing vehicle emissions. UAI is focused on increasing the use of clean-burning ethanol in our gasoline supply to replace harmful aromatic compounds in gasoline. UAI is helping meet public policy goals to lower emissions and reduce carbon in the environment through scientific studies and real-world data to promote new fuels, engine design, and public awareness.

Big River Resources, LLC; Big River United Energy, LLC; Little Sioux Corn Processors, LLC; Midwest AgEnergy; Prairie Horizon Agri Energy; Red Trail Energy, LLC; Siouxland Ethanol; and Tharaldson Ethanol, are renewable fuel producers currently engaged in the production of ethanol for fuel.

Fagen, Inc., is an industrial construction company whose projects include biorefineries engaged in the production of ethanol for fuel.

II. HIGH-OCTANE MIDLEVEL ETHANOL BLENDS WOULD ENABLE MORE EFFICIENT VEHICLES AND REDUCE CARBON DIOXIDE EMISSIONS AND OTHER POLLUTION.

The proposed SAFE rule requests comment on "the potential benefits, or disbenefits," of higher octane fuel.[1] In particular, the proposed rule requests comment on

> how increasing fuel octane levels would play a role in product offerings and engine technologies. Are there potential improvements to fuel economy and CO_2 reductions from higher octane fuels?[2]

The answer to this question is emphatically yes. Higher octane fuels would potentially improve real-world fuel economy and lower CO_2 emissions. And there is a strong scientific consensus that high-octane midlevel ethanol blends (E20 to E40) enable a particularly effective means of increasing efficiency and reducing greenhouse gas emissions beyond what is possible today. In addition, as discussed in separate comments filed by the Illinois, Iowa,

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[1] *Safer Affordable Fuel-Efficient (Safe) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*, 83 Fed. Reg. 42,986, 43,041 (Aug. 24, 2018) ("Proposed SAFE Rule").

[2] *Id.*

Kentucky, and Missouri Corn Growers Associations, midlevel ethanol blends would also be price-competitive with regular gasoline at the pump, making high-octane fuel accessible to consumers at affordable prices.

A. Midlevel Ethanol Blends Would Improve Engine Efficiency and Reduce the Cost of Compliance with Fuel Economy Standards.

EPA has repeatedly acknowledged that high-octane fuel such as E30 (gasoline blended with 30% ethanol) could allow vehicle manufacturers "to raise compression ratios to improve vehicle efficiency as a step toward complying with the 2017 and later light-duty greenhouse gas and CAFE standards."[3]

Automakers agree. For example, in the 2014 Tier 3 rulemaking, the Alliance of Automobile Manufacturers and the Association of Global Automakers explained that ethanol's "in cylinder cooling effect" and high octane rating make a "mid-level gasoline-ethanol blend" particularly well suited for "improv[ing] vehicle efficiency and lower[ing] GHG emissions," through "increas[ing] the engine compression ratio" and "downsizing of the engine."[4] The trade groups noted that "[w]hile higher ethanol, higher octane fuels can be useful in all types of engines to varying degrees, they are of particular benefit to direct-injection (DI) engines," which are becoming more prevalent because of their efficiency benefits.[5]

Individual automakers also supported high-octane midlevel ethanol blends. "Ford strongly recommend[ed] that EPA pursue . . . introduction of an intermediate level blend fuel (E16-50), with a minimum octane rating . . . that increases proportionally as ethanol is splash-blended on top of [conventional] gasoline" to enable "a new generation of highly

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[3] *Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards*, 79 Fed. Reg. 23,414, 23,528 (Apr. 28, 2014) ("Tier 3 Rule"); *see also* Proposed SAFE Rule, 83 Fed. Reg. at 43464 ("Higher octane gasoline [like E30] could provide manufacturers with more flexibility to meet more stringent standards by enabling opportunities for use of lower CO_2 emitting technologies (e.g., higher compression ratio engines, improved turbocharging, optimized engine combustion).").

[4] Stephen Douglas & Julia Rege, Alliance of Automobile Manufacturers & Association of Global Automakers, Comments on Proposed Tier 3 Rule, EPA-HQ-OAR-2011-0135-4461 (July 1, 2013), at 52 ("Auto Alliance Tier 3 Comments").

[5] *Id.* at 53.

efficient internal combustion engine vehicles," like those "already found in Europe."[6] GM likewise "support[ed] the future of higher octane and higher ethanol content in order to provide a pathway to improved vehicle efficiency and lower GHG emissions."[7] Mercedes-Benz endorsed "a higher octane, mid-blend certification fuel such as E25 as a key enabler for GHG reduction," noting that its "vehicle offerings [already] include those with E25 capability in various global markets that could be introduced . . . to the U.S. market if regulatory and commercial conditions warrant."[8]

Consistent with the automakers' comments, the National Academy of Sciences (NAS) found in 2015 that ethanol's "high-octane rating has the potential to provide for an increase in fuel economy by increasing the compression ratio" in optimized high-octane fuel vehicles and recommended that NHTSA and EPA consider "the option to use E30 as a certification fuel" as a path to compliance with future fuel economy and GHG standards.[9] As early as 2013, Department of Energy scientists at Oak Ridge National Laboratory also noted that future increases in engine efficiency were "limited by combustion knock from the octane number and physical-chemical properties of current market-available fuels."[10] Oak Ridge found that "midlevel ethanol blends such as E30 open the potential for [higher] engine compression ratios and expanded downsize + downspeed powertrain approaches, providing clear pathways to improved vehicle fuel economy using existing engine technologies."[11]

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[6] Cynthia Williams, Ford Motor Company, Comments on Proposed Tier 3 Rule, EPA-HQ-OAR-2011-0135-4349 (July 1, 2013), at 16, 17 ("Ford Tier 3 Comments").

[7] Robert Babik, General Motors LLC, Comments on Proposed Tier 3 Rule, EPA-HQ-OAR-2011-0135-4288 (June 28, 2013), at 14 ("GM Tier 3 Comments").

[8] Julian Soell & R. Thomas Brunner, Mercedes-Benz, Comments on Proposed Tier 3 Rule, EPA-HQ-OAR-2011-0135-4676 (June 28, 2013), at 3-4 ("Mercedes Comments").

[9] Nat'l Research Council, Cost, Effectiveness and Deployment of Fuel Economy Technologies for Light-Duty Vehicles 69, 82 (2015).

[10] Derek A. Splitter & James P. Szybist, *Experimental Investigation of Spark-Ignited Combustion with High-Octane Biofuels and EGR. 1. Engine Load Range and Downsize Downspeed Opportunity*, 28 Energy & Fuels 1418, 1419 (2014).

[11] *Id.*

These comments and findings are supported by an overwhelming body of scientific evidence demonstrating that a midlevel ethanol blend (20 to 40% ethanol) with a higher Research Octane Number (RON)—a measure of knock-resistance—would enable significant increases in vehicle efficiency through higher compression ratio engines.[12] This would in turn allow automakers to reduce tailpipe CO_2 emissions by 5% to 10%.[13]

The relationship between higher octane fuel and improved engine efficiency is scientifically straightforward. The maximum efficiency of today's spark-ignition gasoline internal combustion engine is thermodynamically bound by the engine's compression ratio—the ratio of the volume of the cylinder when the piston at "bottom dead center" or maximum intake relative to the volume of the piston at "top dead center" or maximum compression.[14] Thus, increasing engine compression ratios directly increases engine efficiency. But without (competitively priced) high-octane fuel, automakers' ability to increase compression ratios is limited by the increased risk of engine "knock"—the pre-ignition of fuel in the combustion chamber.[15] Thus, engineers from major auto companies

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[12] *See* Derek A. Splitter & James P. Szybist, *Experimental Investigation of Spark-Ignited Combustion with High-Octane Biofuels and EGR. 1. Engine Load Range and Downsize Downspeed Opportunity*, 28 Energy & Fuels 1418 (2014) (demonstrating that "midlevel alcohol blends" could enable engine design strategies resulting in "increases in efficiency and reductions in CO_2").

[13] *See* Thomas G. Leone et al., *The Effect of Compression Ratio, Fuel Octane Rating, and Ethanol Content on Spark-Ignition Engine Efficiency*, 49 Envtl. Sci. & Tech. 10,778, 10,785 (2015) ("Leone 2015") (finding a CO_2 emissions decrease of 6% to 9.6% with a 101 RON E30 blend in an engine with a 13:1 compression ratio relative to a baseline E10 fuel); Thomas G. Leone et al., *Effects of Fuel Octane Rating and Ethanol Content on Knock, Fuel Economy, and CO_2 for a Turbocharged DI Engine*, 7 SAE J. of Fuels & Lubricants 9, 22 (2014) (finding that a 101 RON blend of E30 in an engine with a 13:1 compression ratio could lower CO_2 emissions by 6% to 9% relative to a regular E10 fuel in an engine with a 10:1 compression ratio); Robert A. Stein et al., *Overview of Ethanol Blends' Impacts on SI Engine Performance, Fuel Efficiency, and Emissions*, 6 SAE Int. J. Engines 470 (2013) (finding that a 101 RON E30 blend in an engine with a 11.9:1 compression ratio provides a 5% to 7% decrease in CO_2 emissions relative to a regular E10 fuel in an engine with a 10:1 compression ratio).

[14] Nat'l Research Council, supra note 9, at 25 n.6; *id.* at 67–68, Fig. 2.12; *id.* 401. Spark-ignition gasoline engines will continue dominating light-duty vehicle powertrains for the foreseeable future. *Id.* at 3.

[15] *Id.* at 25 n.7.

have concluded that "[h]igher octane fuel is a key enabler for improved efficiency based on current engine/vehicle design trends."[16]

Midlevel ethanol blends are particularly well-suited to improve engine efficiency because even apart from ethanol's extremely high octane rating, midlevel ethanol blends also have a higher octane sensitivity, higher heat of vaporization, and improved part-load efficiency compared to gasoline, properties that "provide additional engine efficiency benefits."[17] Indeed, the science shows that at the same octane level, vehicles optimized to run on a midlevel ethanol blend are always more efficient than vehicles optimized to run on current gasoline.

Midlevel ethanol blends would generate significant fuel economy gains for automakers, provided that the fuel-economy formula's R-factor is corrected to comply with the law, as discussed below.[18] Absent a correction to the R-factor, any vehicle fuel economy changes with midlevel ethanol blends would be "small . . . because the greater efficiency enabled by the fuels' greater octane ratings approximately offset the reductions in fuel energy content due to the greater ethanol content."[19]

Midlevel ethanol blends would also enable drivers to achieve real-world fuel economy gains. Under the more aggressive driving conditions experienced by U.S. drivers, the off-cycle efficiency benefits of midlevel ethanol blends would generate fuel economy gains that are not captured in the agencies' admittedly imperfect two-cycle tailpipe test.[20]

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[16] Leone 2015, *supra* note 13, at 10,787.

[17] *Id.* at 10,781–84; *see also id.* at 10,786 ("Higher ethanol content is one available option for increasing the octane ratings of gasoline and would provide additional engine efficiency benefits for part and full load operation."); *see also* Derek Splitter et al., *A Historical Analysis of the Co-evolution of Gasoline Octane Number and Spark-Ignition Engines*, 16 Front. Mech. Eng. 15 (2016) ("[S]tudies illustrate that the potential to increase engine performance and fuel economy offered through intermediate ethanol-gasoline blends extends beyond increased octane number alone.").

[18] *See infra* at pp. 14–18. The agencies are required to use test cycle procedures that produce results identical to the two-cycle tailpipe test procedure used in 1975. 49 U.S.C. § 32904(c). That test cycle is compromised of the "urban" or federal test procedure cycle, and the "highway fuel economy test" or "HFET" cycle. *Id.*; 40 C.F.R. § 600.206–12.

[19] *Id.* at 10786.

[20] James E. Anderson et al., *High Octane Number Ethanol-Gasoline Blends: Quantifying the Potential Benefits in the United States*, 97 Fuel 585, 591 (Mar. 23, 2012) ("The observed [fuel economy] benefit

Given the scale of light-duty vehicle fuel consumption, even modest real world "fuel economy increase could have an economic impact of several billions of dollars annually."[21]

B. Midlevel Ethanol Blends Would Enable Significant CO_2 Reductions.

As noted, studies estimate that high-octane, midlevel ethanol blends could reduce tailpipe CO_2 emissions by 5 to 10% in new vehicles, far more than is possible with conventional E10 gasoline.[22] This is due not only to the inherently higher vehicle efficiency achievable with midlevel ethanol blends, but also to the lower carbon-intensity of midlevel ethanol blends compared with gasoline. Indeed, high-octane midlevel ethanol blends lower tailpipe CO_2 emissions *even assuming no gain in vehicle fuel economy*.[23] For example, according to a study by Ford, GM, and Fiat Chrysler engineers, simply adding ethanol to existing E10 gasoline to blend a high-octane, E30 fuel, would enable a 7% reduction in tailpipe CO_2 emissions even assuming that ethanol's lower energy content causes a slight decrease in fuel economy, a conservative assumption.[24]

Midlevel ethanol blends would also lower lifecycle CO_2 emissions. According to Argonne National Laboratories, high-octane E25 and E40 blends blended with corn-based conventional ethanol would lower lifecycle greenhouse gas emissions by "5% and 10%" respectively, not including tailpipe CO_2 reduction benefits.[25] That means that overall, a high-octane, midlevel ethanol blends, could reduce total lifecycle emissions by 10% to 20%

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depends on many factors of engine design, calibration, and operation, but modern engine controls take advantage of both mechanisms. Improvements in fuel efficiency would be realized under high-load or high-acceleration conditions observed in actual consumer driving and present in the US06 drive cycle (which strongly affects the highway fuel economy reported on window stickers). However, fuel with higher octane ratings would not provide a significant fuel economy benefit in the more lightly loaded US EPA Metro-Highway drive cycle used for fuel economy label ratings prior to 2008."). Recognizing that the current test procedures are inaccurate, EPA allows manufacturers to opt for a more accurate 5-cycle methodology. *See* 40 C.F.R. § 86.1869-12(c).

[21] *Id.*

[22] *Supra* note 13.

[23] Leone 2015, *supra* note 13, at 10,781–84, 10,786.

[24] *Id.* at 10785, Table 2.

[25] Jeongwoo Han et al., Well-to-Wheels Greenhouse Gas Emissions with Various Market Shares and Ethanol Levels, ANL-ESD-10-15, 64 (2015).

compared with current regular gasoline. For comparison, EPA projected that its model year 2012 to 2016 greenhouse gas standards would reduce new-vehicle CO_2 emissions by 15%.[26]

In short, high-octane midlevel ethanol blends are a scientifically demonstrated means to improve vehicle efficiency, increase real world fuel economy, and reduce CO_2.

C. High-Octane Midlevel Ethanol Blends Would Reduce Conventional Pollution.

Recent evidence shows that making the transition from today's E10 gasoline to a midlevel blend would reduce tailpipe and evaporative emissions. Many studies have established that midlevel ethanol blends would reduce particulate matter (PM) mass and number, aromatics, polycyclic aromatic hydrocarbons (PAH), non-methane organic gases (NMOG), nitrogen oxides (NO_X), and other pollutants to an even greater extent than E10.[27] Additionally, blending a higher volume of ethanol into gasoline would reduce the volatility of the fuel mixture, which would reduce evaporative emissions associated with E10.[28] By contrast, the use of higher aromatics levels to increase octane would significantly contribute to harmful emissions.[29]

1. Aromatic Hydrocarbons and Secondary Organic Aerosol Pollution

Midlevel ethanol blends would reduce benzene, toluene, ethylbenzene, and xylene (collectively known as BTEX) aromatic emissions. Researchers at the University of California have shown that a fuel blend of 51% ethanol reduces BTEX emissions relative to

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[26] EPA, EPA and NHTSA Finalize Historic National Program to Reduce Greenhouse Gases and Improve Fuel Economy for Cars and Trucks 4 (Apr 2010), https://nepis.epa.gov/Exe/ZyPDF.cgi/P100AKHW.PDF?Dockey=P100AKHW.PDF.

[27] Ethanol also reduces hazardous toxics such as polycyclic aromatic hydrocarbons (PAHs). *See, e.g.*, M.A. Costagliola et al., *Combustion Efficiency and Engine Out Emissions of a S.I. Engine Fueled With Alcohol/Gasoline Blends*, Applied Energy 1, at 9 (2012) (showing reductions in toxic PAHs).

[28] *See* Stein et al, *supra* note 13, at 485 (noting that "reduction in RVP from blends above E10 should reduce [evaporative] emissions").

[29] *See* Georgios Karavalakis et al., *Evaluating the Effects of Aromatics Content in Gasoline on Gaseous and Particulate Matter Emissions from SI-PFI and SIDI Vehicles*, 49 Environ. Sci. & Tech. 7021 (2015) (showing that increasing aromatics increases emissions).

E10.[30] This is particularly important because benzene is a known carcinogen, and because BTEX emissions are known to contribute significantly to the formation of secondary organic aerosol, a form of deadly particulate matter.[31] Secondary organic aerosol formed from gasoline light-duty vehicle BTEX emissions if of particular concern because it causes significant premature deaths and respiratory illnesses in populated urban areas with heavy traffic.[32]

BTEX emissions are highly correlated with gasoline aromatics content, so displacing gasoline containing aromatics with ethanol reduces BTEX emissions.[33] By contrast, in one study, raising total aromatics content from 15% to 25% increased BTEX emissions by a range of 52% to 103%, and further raising aromatics content from 25% to 35% increased BTEX emissions by a range of 81% to 194%.[34]

2. Primary PM and PN

Midlevel ethanol blends would facilitate reductions in PM tailpipe emissions. In general, ethanol reduces PM because it replaces aromatic hydrocarbons that have high double bond equivalent (DBE) values and therefore "disproportionately contribute to PM formation."[35] But ethanol also tends to reduce PM for two additional reasons: first,

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[30] Georgios Karavalakis et al., *Assessing the Impacts of Ethanol and Isobutanol on Gaseous and Particulate Emissions from Flexible Fuel Vehicles*, 48 Environ. Sci. & Technol. 14016, 14021 (2014).

[31] *See* Drew R. Gentner et al., *Review of Urban Secondary Organic Aerosol Formation from Gasoline and Diesel Motor Vehicle Emissions*, 51 Environ. Sci. & Tech. 1074, 1078 (Dec. 21, 2016); J.R. Odum et al., *The Atmospheric Aerosol-Forming Potential of Whole Gasoline Vapor*, 276 Science 96, 96 (1997) ("[T]he atmospheric organic aerosol formation potential of whole gasoline vapor can be accounted for solely in terms of the aromatic fraction of the fuel.").

[32] *See* Katherine Von Stackelberg et al., *Public Health Impacts of Secondary Particulate Formation from Aromatic Hydrocarbons in Gasoline*, 12 Environ. Health 1, 10 (2013).

[33] Karavalakis et al., *supra* note 29, at 7026; *See, e.g.*, John M. Storey et al., *Novel Characterization of GDI Engine Exhaust for Gasoline and Mid-Level Ethanol Blends*, SAE Tech. Paper 2014-01-1606, at 7 ("Storey 2014") ("[E]thanol is believed to interfere with the formation of aromatic compounds by short-circuiting the formation of conjugated double bonds.").

[34] *Id.*

[35] Stein et al, *supra* note 13, at 11. Double bond equivalent value, or DBE, is a measure of the number of double bonds and rings in the fuel molecule, defined as the number of hydrogen atoms which would be required to fully saturate the molecule. *Id.*

ethanol's relatively high vapor pressure and low boiling point (78°C) allow it to lower the boiling point of the fuel mixture, improving combustion; second, ethanol's higher oxygen content helps it to promote leaner combustion and avoids the impingement of soot in gasoline direct-injection (GDI) engines.[36]

Numerous studies confirm that in both GDI and port fuel injection (PFI) engines, midlevel ethanol blends reduce PM and particle number (PN) emissions.[37]

Many other studies corroborate these predictions. Oak Ridge National Laboratory studies conducted in 2010 and 2012 show that E20 reduces average PM and PN relative to E10 and E0.[38] A more recent Oak Ridge study confirms that E30 also reduces PM and PN emissions.[39] Another recent study found that transitioning to higher ethanol blends could cut PN emissions by 30% or more.[40] In another study, raising aromatics content from 15% to current levels of 25% was found to raise PM emissions by 148%.[41]

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[36] *Id.*

[37] *See* James Anderson et al., *Issues with T50 and T90 as Match Criteria for Ethanol-Gasoline Blends*, 7 SAE Int'l J. Fuels & Lubr. 1027, 1031 & nn.1, 13, 14, 15, 16, 17 ("[T]he reduction of PM emissions with the addition of ethanol . . . has been demonstrated in many studies and is supported by fundamental combustion chemistry considerations."); Costagliola et al., *supra* note 27, at 6 (reporting that E20 reduced particle number (PN) emissions by 30% and PM emissions by 10% relative to E10 "[a]t the same engine load").

[38] *See* John M. Storey et al., *Exhaust Particle Characterization for Lean and Stoichiometric DI Vehicles Operating on Ethanol-Gasoline Blends*, SAE Tech. Paper 2012-01-0437 ("Storey 2012") (showing PM and particle number (PN) reductions with the addition of ethanol in a GDI engine); M. Matti Maricq et al., *The Impact of Ethanol Fuel Blends on PM Emissions from a Light-Duty GDI Vehicle*, 46 Aerosol Sci. & Tech. 576, 580 (2011) (finding an average 45% reduction in PM emissions when the ethanol content of fuel is increased from 0% to 32% in a turbocharged GDI engine); John M. Storey et al., *Ethanol Blend Effects On Direct Injection Spark-Ignition Gasoline Vehicle Particulate Matter Emissions*, 3 SAE Int. J. Fuels Lubr. 650, 653 (2010) ("Storey 2010) (finding that E20 reduced PM by 30% relative to E0 over the federal test procedure, and 42% over the more aggressive US06, in a GDI vehicle); *id.* at 656 (finding that E20 decreases PN by 80% to 90% relative to E0 in a GDI vehicle).

[39] Storey 2014, *supra* note 33 (noting that E30 "shows a reduction in [PM] mass, consistent with earlier studies with E20").

[40] Costagliola et al., *supra* note 27, at 6 (finding a minimum 30% reduction for higher ethanol blends).

[41] Karavalakis et al., *supra* note 29, at 7027.

3. NO_X, NMOG, and Ozone

Mid-level ethanol blends would also reduce or have no significant effect on emissions of NO_X and organic compounds that contribute to ozone. The 2014 Ford study found that in a flex-fuel vehicles calibrated to sense the higher oxygen content of ethanol, "emissions of NO_X decreased by approximately 50% as the ethanol content increased from E0 to E20–E40."[42] Multiple studies find significant NO_X reductions from midlevel ethanol blends in non-flex-fuel vehicles.[43] Others, to be sure, find no change or even a slight increase in NO_X emissions, depending on the model year of the vehicle, vehicle calibration, and other test factors. Beyond these potential small immediate effects on NO_X, the evidence does not support any claim that midlevel ethanol blends would cause any long-term increases in NO_X emissions by damaging vehicle emission controls, even in today's conventional gasoline (non-flex-fuel) vehicles.[44] There is thus no reason to believe that NO_X emissions will increase in *future* vehicles *expressly designed and certified* to use midlevel ethanol blends. At worst, midlevel ethanol blends would have no significant effect on vehicle NO_X emissions.

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[42] Carolyn Hubbard et al., *Ethanol and Air Quality: Influence of Fuel Ethanol Content on Emissions and Fuel Economy of Flexible Fuel Vehicles*, 48 Environ. Sci. & Tech. 861, 864 (2014).

[43] Mustafa Canakci et al., *Impact of Alcohol-Gasoline Fuel Blends on the Exhaust Emission of a Spark Ignition Engine*, 52 Renewable Energy, 111–17 (2013) (finding decreases in NO_X emissions of 13.5% and 15.5%, depending on speed, when ethanol content is increased from 0% to 10%, respectively, in a gasoline engine (used in the Honda Civic) with a 10.4:1 compression ratio); Hosuk H. Jung et al., *Effect of Ethanol on Part Load Thermal Efficiency and CO_2 Emissions of SI Engines*, 2013-01-1634, 6 SAE Int'l J. of Engines 456 (2013) (finding a 25% to 45% decrease in NO_X emissions, depending on speed and load, from E85 relative to E0, for an engine with a 9.5:1 compression ratio); Maricq et al., *supra* note 38, at 580 (finding decreases in NO_X emissions of "about 20%" when the ethanol content of fuel is increased from 0% to 17% or higher in a turbocharged GDI engine); M. Bahattin Celik et al., *Experimental Determination of Suitable Ethanol-Gasoline Blend Rate at High Compression Ratio for Gasoline Engine*, 28 Applied Thermal Engineering 396 (2008) (finding a 33% decrease in NO_X emissions from E50 relative to E0 in a single-cylinder engine at stoichiometric fuel conditions, with a compression ratio of 6:1); Koichi Nakata et al., *The Effect of Ethanol Fuel on a Spark Ignition Engine*, SAE Tech. Paper 2006-01-3380 (finding a 25% decrease in NO_X emissions from E50 relative to E0 in an engine (used in the Toyota Corolla) with a compression ratio of 13:1); *see also* Robert A. Stein & Rod Harris, Effect of Ethanol on NO_X Emissions of Vehicles with SI Engines, at 5 ("NO_X emissions typically decrease or are unaffected with increasing ethanol content.").

[44] Brian H. West et al., Intermediate Ethanol Blends Catalyst Durability Program D-7 (Feb. 2012) ("[I]t appears reasonable to conclude that the use of ethanol fuels does not change the aging that is observed for NO_X.").

The same goes for non-methane organic gas ("NMOG") tailpipe emissions. The 2014 Ford study found that NMOG tailpipe emissions "exhibit a clear minimum around E20–E40," lowering emissions by 25% and 35% relative to E0.[45] Studies of conventional legacy vehicles find no short-term or long-term change in NMOG tailpipe emissions with midlevel ethanol blends.[46] There is thus no reason to believe that NMOG tailpipe emissions will increase in future vehicles designed and certified to use midlevel ethanol blends. At worst, midlevel ethanol blends would have no significant effect on vehicle NMOG tailpipe emissions.

Finally, increasing ethanol content above 10% reduces the RVP of the fuel, lowering NMOG evaporative emissions.[47]

III. EPA Should Remove Regulatory Barriers that Limit Demand for High-Octane Midlevel Ethanol Blends.

In the proposed rule, EPA "requests comment on if and how EPA could support the production and use of higher octane gasoline consistent with Title II of the Clean Air Act."[48] In connection with this request for comment, EPA notes that "[s]takeholders suggested that mid-level (e.g., E30) high octane ethanol blends should be considered and that EPA should consider requiring that mid-level blends be made available at service stations. Higher octane gasoline could provide manufacturers with more flexibility to meet more stringent standards by enabling opportunities for use of lower CO_2 emitting technologies (e.g., higher compression ratio engines, improved turbocharging, optimized engine combustion)."[49]

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[45] Hubbard et al., *supra* note 42, at 863.

[46] West*, supra* note 44, D-8.

[47] Stein et al, *supra* note 13, at 485 (noting that "reduction in RVP from blends above E10 should reduce [evaporative] emissions"); *see also Partial Grant of Clean Air Act Waiver Application Submitted by Growth Energy to Increase the Allowable Ethanol Content of Gasoline to 15 Percent*, 76 Fed. Reg. 4662, 4680 (Jan. 26, 2011) ("[T]he lower volatility of E15 would lead to significantly lower evaporative emissions than would otherwise result from canister breakthrough with E10.").

[48] Proposed SAFE Rule, 83 Fed. Reg. at 43,464.

[49] *Id.*

Midlevel ethanol blends should be considered because they would be ideal fuels to reduce CO_2 emissions. But despite the universally acknowledged efficiency and emissions benefits of midlevel ethanol blends, auto manufacturers have not yet produced the vehicles needed to realize these benefits, and the fuel is not universally available. That is because EPA rules have restricted the use of such fuel in the certification of new vehicles and in the market. EPA can and should remove the regulatory barriers that it has created and open the fuel market to fair competition before mandating a minimum octane standard. Midlevel ethanol blends offer the cleanest and most economical means of raising octane nationwide. An octane standard that is not accompanied by regulatory relief for midlevel ethanol blends would impose significant costs on consumers and the environment: Unless higher blends of ethanol can be sold, the octane will come from costly (and toxic) aromatic hydrocarbons derived from petroleum.

A. EPA Should Approve a Midlevel Ethanol Certification Fuel and Revise Rules that Inhibit Auto Manufacturers from Applying for a New Certification Fuel.

In its 2013 comments describing the efficiency benefits of vehicles designed for midlevel ethanol blends, Ford Motor Company noted that these next-generation vehicles are "already found in Europe," and that "the introduction of higher octane rated/intermediate level ethanol blend fuel would allow for a faster introduction of more efficient vehicle designs from Europe . . . without the need for significant design changes."[50]

Auto manufacturers are currently unable to introduce these next-generation vehicles in the United States, because EPA has not yet approved a high-octane fuel for certification testing of new vehicles. If EPA were to approve a midlevel ethanol certification fuel—like a 98 RON E25 or 100 RON E30 blend—then vehicle manufacturers could build and sell vehicles designed to take advantage of the fuel's octane rating and other properties.

[50] Ford Tier 3 Comments, *supra* note 6, at 17.

EPA should approve such a new certification fuel. EPA could simply announce that the new certification fuel is available, as it has done in the past.[51] Or the Agency could expressly invite auto manufacturers to propose a specification for a new certification fuel.[52]

In addition, EPA should revise its regulations governing the approval of certification test fuels. In its Tier 3 Rule, EPA discouraged auto manufacturer applications for new test fuels by purporting to require an automaker to demonstrate that a proposed alternative test fuel is already "readily available nationwide."[53] That was an impossible requirement for a new fuel. In subsequent litigation, however, EPA retracted this unwarranted and illogical requirement, conceding explicitly that it has discretion to grant applications for test fuels that are not yet commercially available.[54] EPA should revise the innovation-chilling "commercially available" rule to align with the Agency's concessions in litigation.[55]

To make its understanding of the alternative certification fuel rule abundantly clear to all stakeholders, EPA should amend the rule to clearly state—*as the Agency has already conceded in litigation*—that an auto manufacturer need not demonstrate that a proposed alternative certification fuel is currently available in commerce nationwide. It should suffice for a manufacturer to declare, based on its judgment and experience, that the requested fuel would likely be marketable in the future.

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[51] *See, e.g.*, *Recodification of Motor Vehicle Emissions Regulations*, 40 Fed. Reg. 27590, 27613-14 (June 30, 1975) (40 C.F.R. §§ 86.177-6(a) (gasoline), 86.177-6(b) (diesel)); *Standards for Emissions from Methanol-Fueled Motor Vehicles and Motor Vehicle Engines*, 54 Fed. Reg. 14426, 14563 (Apr. 11, 1989) (40 C.F.R. § 86.1213-90(c)); *Standards for Emission from Natural Gas-Fueled, and Liquefied Petroleum Gas-Fueled Motor Vehicles and Motor Vehicle Engines, and Certification Procedures for Aftermarket Conversions*, 59 Fed. Reg. 48472, 48513-14 (Sept. 21, 1994) (40 C.F.R. § 86.513-94(d) (natural gas); *id.* § 86.513-94(e) (Liquified Petroleum Gas)); *Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land-Based)*, 67 Fed. Reg. 68,242, 68,423 (Nov. 8, 2002) (§ 1065.801(a)) (E85).

[52] *See* 40 C.F.R. § 1065.701(c); 40 C.F.R. § 86.113-94(g).

[53] Tier 3 Rule, 79 Fed. Reg. at 23,414 (interpreting 40 C.F.R. § 1065.701(c)).

[54] EPA Response to Pet'n for Panel Reh'g at 7 n.3, *Energy Future Coalition v. EPA*, No. 14-1123 (D.C. Cir., Sept. 21, 2015) ("The Agency has ample discretion to consider requests on a case-by-case basis, and may evaluate trends and future market projections when considering whether to approve an alternative test fuel that is not currently on the market.").

[55] *See* 40 C.F.R. § 1065.701(c).

The rule should also make clear that EPA would approve such a certification fuel for vehicles that are *also* designed to run on ordinary gasoline, as dual-fueled vehicles do by definition. This possibility would allow automakers to dual-certify more efficient vehicles that can run on both premium gasoline and high-octane midlevel ethanol blends on a transitional basis, until midlevel ethanol blends are widely available to fuel consumers. Clarifying the rule in this way would encourage auto manufacturers to apply for the alternative certification fuels to build more efficient, cleaner, and cost-effective vehicles.

B. EPA Should Correct Its Inaccurate Fuel Economy Equation to Allow the Use of Midlevel Ethanol Blends.

EPA should repeal and replace its outdated fuel economy equation. EPA has admitted that part of that equation–a constant known to EPA and stakeholders as the R-factor—is erroneous and that it unfairly penalizes fuel with ethanol in it; but EPA has not yet fixed the problem. The problem is an important one for automakers, which face increasingly challenging fuel economy standards (even if the agencies finalize the Proposed Rule's preferred approach), and it discourages them from developing high-efficiency engines designed for fuels with a higher ethanol content.[56]

Under the CAFE program, EPA calculates vehicle fuel economy in two steps.[57] EPA first measures the amount of carbon in the test fuel and in the vehicle exhaust emissions.[58] Then, using a carbon mass-balance equation, EPA derives the volumetric fuel economy value.[59]

The current fuel economy equation for gasoline includes several adjustments meant to control for changes in the test fuel that affect fuel economy. These adjustments implement

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[56] *See* Mercedes Comments, *supra* note 8, at 4 ("An R factor = 1 is a necessary step for the acceptance of mid-level ethanol blends.").

[57] Aron Butler et al., Analysis of the Effects of Changing Fuel Properties on the EPA Fuel Economy Equation and R-Factor, at 1, Memorandum to the Tier 3 Docket, EPA-HQ-OAR-2011-0135 (Feb. 28, 2013).

[58] 40 C.F.R. § 600.113-12(f)(1).

[59] *Id.* § 600.113-12(h)(1) ((5174 x 10^4 x CWF x SG)/[((CWF x HC) + (0.429 x CO) + (0.273 x CO_2)) x ((0.6 x SG x NHV) + 5471)]); *see also id.* Pt. 600, App. II (sample fuel economy calculations).

EPA's statutory obligation to make fuel economy testing on today's fuel comparable to fuel economy testing in 1975 by adjusting for changes in the test fuel that affect fuel economy.[60] This statutory requirement prevents EPA from making back-door changes to the stringency of the CAFE standards through alterations in test procedures, ensuring that any substantive changes in the CAFE standards happen in an accountable and transparent manner.[61] But EPA's current fuel economy equation fails to accurately adjust for changes in the test fuel, as required by law.

The current fuel economy equation includes an adjustment to account for changes in the gasoline test fuel's energy content.[62] This adjustment is necessary because energy content affects fuel economy: In general, a fuel with a higher energy content will increase volumetric fuel economy, whereas a fuel with a lower energy content will reduce volumetric fuel economy.[63] Thus, unless the fuel economy equation accurately adjusts for changes in the energy content of the test fuel, fuel economy results for test fuels with a lower energy content (like the new E10 gasoline certification fuel) would show illusory losses in vehicle fuel economy.

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[60] 26 U.S.C. § 4064(c) ("Fuel economy . . . shall be measured in accordance with testing and calculation procedures . . . utilized by the EPA Administrator for model year 1975 . . . or procedures which yield comparable results."); 49 U.S.C. § 32904(c) ("[T]he Administrator shall use the same procedures for passenger automobiles the Administrator used for model year 1975 . . . or procedures that give comparable results."); *see also General Motors Corp. v. Costle*, Nos. 80–3271, 80–3272, & 80–3655 (6th Cir. 1982) (Mem.) (requiring EPA to initiate a rulemaking that would establish an "adjustment factor" reconciling current test procedures with previous ones).

[61] *Ctr. for Auto Safety v. Thomas*, 847 F.2d 843, 846 (D.C. Cir. 1988) (en banc) (Wald, C.J., concurring) ("By inserting the comparability requirement, Congress meant to insure that auto manufacturers be credited only with real fuel economy gains, not illusory gains generated by changes in test procedures."), *reh'g granted and opinion vacated on other grounds*, 856 F.2d 1557 (per curiam).

[62] Proposed Tier 3 Rule, 78 Fed. Reg. at 29,913 ("[T]he existing fuel economy equation for gasoline . . . contains an adjustment for the energy content of the test fuel to calculate fuel economy equivalent to what would have been determined using the 1975 baseline test fuel.").

[63] *See id.* ("Because ethanol has a lower energy content than gasoline, i.e., fewer British thermal units (Btus) or joules per gallon, and fuel economy is defined in terms of miles per gallon of fuel, it is almost certain that the same vehicle tested on a test fuel with 15 percent ethanol content will yield a lower fuel economy value relative to the value if it were tested on the current test fuel with zero ethanol content.").

EPA's current fuel economy equation for gasoline creates such an illusory loss in vehicle fuel economy. The source of this error is a vehicle sensitivity measure in the equation known as the R-factor. The R-factor is a measure of "how vehicles respond to changes in the energy content of the fuel."[64] The current R-factor of 0.6, for example, erroneously implies that a 10% change in the test fuel's energy content causes only a 6% change in vehicle fuel economy.[65]

The current erroneous R-factor is based on outdated vehicle data from mid-1980s carbureted engines that has no application to today's fuel injection engines.[66] Many studies since then have shown that today's vehicles are much more responsive to changes in energy content, and that a higher R-factor is needed to accurately control for changes in the test fuel.[67] EPA itself has acknowledged that the current R-factor is wrong and suggested that a corrected value might lie "between 0.8 and 0.9."[68] The auto industry has asked EPA to adopt an R-factor of 1.0.[69]

EPA has repeatedly promised to fix the R-factor, but it has never done so. In 2012, EPA assured automakers that it would fix the R-factor "in a timely manner" when it changed the test fuel.[70] In 2014, EPA updated its test fuel to reflect in-use gasoline with 10

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[64] Tier 3 Rule, 79 Fed. Reg. at 23,531.

[65] *Id.* (stating that the R-factor's "value is presently set at 0.6"); Proposed Tier 3 Rule, 78 Fed. Reg. at 29,913 (stating that the R-factor "account[s] for the fact that the change in fuel economy is not directly proportional to the change in energy content of the test fuel.").

[66] Butler et al., *supra* note 57, at 3 (citing 1985 studies).

[67] *Id.* at 3.

[68] *Id.* at 4–5.

[69] Tier 3 Rule, 79 Fed. Reg. at 23,531 ("[T]he manufacturers commented that . . . EPA should finalize an appropriate test procedure adjustment in the Tier 3 rulemaking, including adoption of an 'R' factor of 1.0.").

[70] *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*, 77 Fed. Reg. 62,623, 62,777–78 ("If the certification test fuel is changed to include ethanol through a future rulemaking, EPA would be required under EPCA to address the need for a test procedure adjustment to preserve the level of stringency of the CAFE standards. EPA is committed to doing so in a timely manner to ensure that any change in certification fuel will not affect the stringency of future GHG emission standards.").

percent ethanol,[71] but it failed to change the R-factor.[72] Instead, EPA kicked the can down the road, requiring automakers to use the outdated E0 gasoline test fuel for fuel economy testing until at least 2020.[73]

EPA's failure to resolve this issue in a timely manner is of particular concern because it deters automakers from seeking to certify vehicles with high-octane midlevel ethanol blends. As Mercedes explained in its Tier 3 comments, "given that the volumetric energy content of an E25 Tier 3 fuel would be almost 9% lower than an E0 fuel" currently used for fuel economy certification, correcting the R-factor "is a necessary step for the acceptance of" midlevel ethanol blends like E25.[74] As Mercedes also explained, an "R-factor of 0.6, as is currently the case, would result in approximately [a] 5% [illusory] volumetric fuel efficiency loss for an E25 fuel, which mathematically hinders any manufacturer seeking to certify a vehicle on such a fuel."[75]

EPA should finalize an R-factor of 1.0 for the E10 gasoline test fuel. This would allow automakers to use the new test fuel for CAFE compliance purposes without being unfairly penalized for using a test fuel with a lower energy content. EPA should also apply the same R-factor of 1.0 to any future alternative midlevel ethanol certification fuels (E20 to E40).

With an R-factor of 1, the corrected fuel-economy equation for E10 would be as follows:

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[71] 40 C.F.R. § 86.113-15; 40 C.F.R. § 1065.710.

[72] Tier 3 Rule, 79 Fed. Reg. at 23531 ("While there has been some data evaluated to assess the impact of changing the emission test fuel on the 'R' factor, EPA did not propose a value in the NPRM and specifically stated that we would continue to investigate this issue and if necessary address it as part of a future action, as opposed to changing it in the Tier 3 final rule."); *id.* at 23532 (stating that current studies "will provide data needed to assess the 'R' value" and stating that "EPA expects to have the needed data in early to mid 2015 and will then be in a position to conduct a thorough assessment of the impacts of different emission test fuels on Tier 3/LEV III vehicles and develop any appropriate adjustments and changes, in consultation and coordination with NHTSA.").

[73] 40 C.F.R. § 600.117(a).

[74] Mercedes Comments, *supra* note 8, at 4.

[75] *Id.*

$$\frac{(5{,}174 \times 10^4 \times CWF)}{\left[\left((CWF \times (NMOG + CH_4)) + (0.429 \times CO) + (0.273 \times CO_2)\right) \times NHV\right]}$$

where,

- 5174×10^4 = density of H_2O at 60ºF x specific gravity of 1975 reference fuel × Net Heating Value (NHV) of 1975 reference fuel;
- CWF is the carbon weight fraction of the certification test fuel;
- NHV is the net heating value of the certification test fuel;
- NMOG is the non-methane organic gas [g/mi] in the exhaust gas as determined in accordance with applicable test procedures;
- CH_4 is the methane [g/mi] in the exhaust gas;
- CO is the carbon monoxide [g/mi] in the exhaust gas; and
- CO_2 is the carbon dioxide [g/mi] in the exhaust gas.

This formula, originally proposed more than four years ago by GM in its Tier 3 rule comments, is based on the current fuel economy equation for gasoline vehicles, with an R-factor corrected to 1.0 and other necessary technical adjustments to account for the oxygen content of midlevel ethanol blends.[76]

In addition to making this basic error correction in the fuel economy formula for all blends containing ethanol, EPA and NHTSA should adopt fuel economy and Carbon Related Exhaust Emission (CREE) formulas specific to midlevel ethanol blends, that appropriately credit the petroleum displacement and carbon neutrality of the ethanol portion of the fuel. UAI endorses the specific proposal contained in separate comments filed by the Illinois, Iowa, Kentucky, and Missouri Corn Growers Associations.

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[76] *See* 40 C.F.R. § 600.113-12(h)(1). The current fuel economy equation for gasoline omits oxygenated hydrocarbons, measuring pure hydrocarbons only instead. *Id.* § 600.113-12(h). "Although oxygenated hydrocarbons are an insignificant contributor to the fuel economy value, their effect has been included" in the proposed formula "by virtue of using NMOG in the equation." GM Tier 3 Comments, *supra* note 7, at 4.

C. EPA Should Update Its Previous, Obsolete Interpretation of the Sub-Sim Law To Remove an Illegal Regulatory Barrier to Higher Concentrations of Ethanol in Existing Vehicles.

EPA officials have previously stated, in informal guidance, that section 211(f) of the Clean Air Act, also known as the sub-sim law, limits the concentration of ethanol that may be blended into gasoline for use in gasoline-fueled vehicles.[77] That is no longer correct.

The sub-sim law prohibits increasing the concentration of any fuel additives that are *not* substantially similar to a certification fuel additive without seeking a waiver. [78] Ethanol is a "fuel additive."[79] And ethanol is substantially similar to a fuel additive used in the certification of new vehicles. Indeed, ethanol itself *is* a fuel additive used in certification: the new gasoline test fuel contains 9.6% to 10% ethanol.[80] Whatever interpretations it may allow, the term "substantially similar" cannot reasonably be interpreted to *exclude* fuel additives that are *identical* to those used in certification.[81] Yet that is exactly what EPA's interpretation does by purporting to cap increases in ethanol blending despite its use in certification fuel.

Because ethanol is now a fuel additive used in an EPA-approved certification fuel, the Clean Air Act authorizes EPA to regulate ethanol *only* under section 211(c)—the same provision that authorizes EPA to regulate other fuel components. Under section 211(c), EPA must demonstrate that a fuel component harms public health or emissions control devices before the Agency may limit its concentration in gasoline. As the D.C. Circuit has explained, EPA must show that a fuel or fuel additive would "significantly increase the total human exposure" to pollution "so as to cause a significant risk of harm to human health."[82]

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[77] *See* Letter from Adam M. Kushner, Air Enforcement Div., EPA, to Bob Greco, Dir. Downstream and Industrial Operations, American Petroleum Institute, at 1 (July 31, 2008).

[78] 42 U.S.C. § 7545(f)(1)(B).

[79] *See* 40 C.F.R. § 79.2(e) (defining additive).

[80] 40 C.F.R. § 1065.710(b)(2).

[81] *Cf. United States v. Home Concrete & Supply, LLC*, 132 S. Ct. 1836, 1846 n.1 (2012) (Scalia, J., concurring in part and concurring in the judgment).

[82] *Ethyl Corp. v. EPA*, 541 F.2d 1, 32 (1976).

EPA has no "power to act on hunches and wild guesses."[83] EPA has not attempted to demonstrate that ethanol harms public health or emission controls devices. Indeed, the best available science demonstrates that adding ethanol to gasoline reduces emissions of harmful pollutants.

EPA's outdated interpretation of "substantially similar" impermissibly shifts EPA's legal burden to ethanol producers, requiring them to prove (contrary to section 211(c)) that a given concentration of ethanol will *not* cause a vehicle's emissions control system to fail.[84] Only then would EPA grant a waiver of the sub-sim law and allow the fuel to be sold.

EPA's past interpretation of the sub-sim law is obsolete for an additional reason. EPA's current interpretive rule (promulgated in 1991) defining the range of fuels that are "substantially similar" to the gasoline certification fuel purports to limit the oxygen content of gasoline to 2.7% by weight, corresponding to roughly 7.5% ethanol by volume.[85] But for roughly the past decade, most gasoline sold in the United States has contained 10% ethanol by volume, and since model year 2017, manufacturers have been required to certify their vehicles with an E10 gasoline test fuel.[86] E10 has approximately 3.8% oxygen by weight, about 40% more oxygen by weight than would be allowed under EPA's outdated interpretative rule.

EPA should withdraw prior guidance misinterpreting the sub-sim law to limit the concentration of ethanol in gasoline, and adopt a new interpretive rule that correctly applies the sub-sim law's plain meaning to changed factual circumstances: the law cannot limit ethanol blending, because ethanol is now a fuel additive used in certification.

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[83] *Ethyl Corp.*, 541 F.2d at 28. A determination of significant risk requires an examination of the "probability and severity" of the risk being regulated. *Id.* at 18.

[84] *Ethyl Corp. v. EPA*, 51 F.3d 1053, 1061 (D.C. Cir. 1995) (citing 42 U.S.C. 7545(c)).

[85] 56 Fed. Reg. 5352 (Feb. 11, 1991).

[86] 40 C.F.R. § 1065.710(b).

D. EPA Should Expedite Its Rule to Rationalize the RVP Standard for Blends Above E10, as the President Has Directed.

The President has already taken an important first step toward enabling midlevel ethanol blends by requiring EPA to reconsider the Reid Vapor Pressure (RVP) rule's senseless restriction on year-round sales of gasoline blends with more than 10% ethanol. This is a necessary—though not sufficient—step toward opening the market for high-octane midlevel ethanol blends, and it is critical that EPA finalize a corrective RVP rule before the May 1 "regulatory control period" that governs upstream participants in the fuel supply chain.[87]

UAI has explained elsewhere that EPA's application of a more stringent RVP standard to blends above E10 has the counterproductive effect of blocking market access for a cleaner fuel even though the Clean Air Act requires no such discriminatory treatment.[88] The result is that most drivers today have no access to E15 even though for several years, E15 has been approved for use in Model Year 2001 and newer vehicles.[89] That is because EPA has needlessly interpreted the Clean Air Act to deprive higher-ethanol blends of the benefit of a partial waiver of the RVP limit, a waiver that—by statute—ought to apply to all gasoline containing at least 10% ethanol.[90]

RVP is a measure of a fuel's tendency to evaporate. In general, fuel must have an RVP of 9 psi or less. But under section 211(h)(4) of the Clean Air Act, a less stringent standard of 10 psi governs "fuel blends containing gasoline and 10 percent denatured anhydrous ethanol."[91] EPA interprets this to apply only to gasoline containing 9 or 10 percent ethanol, effectively inserting the phrase *no more than* into the statute. But the text of the statute hardly requires that result; in light of the statutory context and the properties of

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[87] 40 C.F.R. § 80.27(a)(2).

[88] Urban Air Initiative et al., Midterm Evaluation Comments, EPA-HQ-OAR-2015-0827-9904, at 12-13 & Addendum C (Aug. 21, 2017), *available at* https://bit.ly/2NgfiSZ.

[89] *Partial Grant of Clean Air Act Waiver Application Submitted by Growth Energy To Increase the Allowable Ethanol Content of Gasoline to 15 Percent*, 76 Fed. Reg. 4662 (Jan. 26, 2011).

[90] *Id.* at 4675.

[91] 42 U.S.C. § 7545(h)(4).

higher ethanol blends, the text makes better sense if it is read as encompassing fuel blends that contain *at least* 10 percent ethanol.

EPA's past interpretation is unreasonable, because fuel's evaporative tendency diminishes with increasing levels of ethanol over 10%. In other words, E15 has lower evaporative emissions than E10 does. But, as a result of EPA's double standard, retailers must stop selling E15—an otherwise legal fuel, with *lower* RVP than E10—during certain times of year or else use a separate low-vapor-pressure gasoline blendstock for E15, which is not economically practicable. Thus, EPA regulations have artificially depressed the amount of clean-octane ethanol in the market, despite the economic and environmental benefits that would come with increased ethanol consumption.

This issue is also relevant to blends over E15. EPA's interpretation of the one-pound waiver would irrationally limit the use of midlevel ethanol blends as well, even though they are even cleaner (and more efficient), with less evaporative emissions and lower RVP, than both E10 and E15. Maintaining EPA's current interpretation of the RVP waiver provision would delay commercial adoption of the fuel that the auto industry needs for the next generation of highly efficient engines.

EPA should repeal its rule arbitrarily limiting the one-pound waiver to blends of no more than 10% ethanol, as the President has directed.

IV. EPA SHOULD MANDATE A MINIMUM OCTANE STANDARD PURSUANT TO ITS FUEL REGULATION AUTHORITY.

EPA's proposed SAFE rule opens the door to the "eliminat[ion] of today's lower-octane fuel blends."[92]

At a minimum, EPA should eliminate sub-octane blends Some retailers in high-altitude regions sell sub-octane 85 AKI gasoline instead of the more common 87 AKI regular grade gasoline.[93] The sale of these blends may have been innocuous for 1980s "vehicles using carburated engines without knock sensors."[94] But in today's vehicles, the

[92] 83 Fed. Reg. at 43,041.

[93] Splitter, *supra* note 17, at 12.

[94] Leone 2015, *supra* note 13, at 10780.

continued sale of 85 AKI gasoline "requires manufacturers to accommodate a worst-case scenario approach for consumer fuel choice. The result of this is that the engine design and control strategy is limited to an 85 AKI fuel for manufacturers' durability and warranty considerations."[95] As a result, "the presence of 85AKI in a small portion of the market is a means that inadvertently limits engine efficiency and vehicle fuel economy for all vehicles within the entire market regardless of whether 85AKI fuel is available as a consumer fuel choice for a given location."[96]

In addition to frustrating more efficient new vehicle designs, sub-octane blends also lower fuel economy and increase CO_2 emissions in the existing vehicles that use these fuels.[97]

EPA should not stop at phasing out today's low-octane blends. EPA should consider implementing an orderly transition to a high-octane standard for all new vehicles to take full advantage of the fuel economy and greenhouse gas benefits that midlevel ethanol blends offer.

EPA has acknowledged that CAA § 211(c) gives it authority to "control" gasoline octane levels.[98] EPA can set a minimum octane level under CAA § 211(c)(1) because low-octane gasoline (1) impairs manufacturers' ability to further increase compression ratios to reduce CO_2 emissions to meet EPA's standards and (2) increases CO_2 emissions in existing legacy vehicles.

V. THE CALIFORNIA ELECTRIC-VEHICLE MANDATE IS PREEMPTED BY FEDERAL LAW.

In the proposed SAFE rule, NHTSA correctly concludes that California's "zero emissions vehicle (ZEV) mandate" is expressly and impliedly preempted under both the

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[95] Splitter, *supra* note 17, at 12.

[96] *Id.*

[97] *See* CRC, Final Report on CRC Project No. E-108, at 8 (Mar. 2015) (concluding that "[c]onsistent with the loss of FE, the fleet CO_2 results correspondingly increased for the 85 AKI test fuel").

[98] EPA's Regulatory Authority to Address Octane (May 2015), https://www.epa.gov/sites/production/files/2015-05/documents/050515mstrs_machiele.pdf.

Energy Policy and Conservation Act's (EPCA's) and the Energy Independence and Security Act's (EISA's) plain text and its purposes and objectives.[99]

California's fleet-average ZEV standards are preempted by EPCA and EISA because they relate to "average fuel economy" and because they stand as an obstacle to the statute's objective of increasing average fuel economy.[100] For model years 2021 to 2030, DOT is required to set the "maximum feasible fuel economy standard *for each fleet for each year*."[101] By mandating the sale of substantial numbers of electric vehicles, California's ZEV standard reduces manufacturers' need to produce more fuel-efficient vehicles on a fleet-average basis, as electric vehicles already receive a generous fuel economy compliance credit under the CAFE program.[102] This substantially reduces the average fuel economy of the fleet. The ZEV standards are therefore related to "average fuel economy" and preempted by EPCA and EISA.

The ZEV standards are also preempted because they stand as an obstacle to EISA's objectives.[103] EISA allows manufacturers a choice between improving gasoline vehicle fuel economy and producing a variety of alternative fuel vehicles capable of operating on

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[99] Proposed SAFE Rule, 83 Fed. Reg. at 43,238.

[100] A California district court entered a preliminary injunction against California's 2001 ZEV regulations based on this reasoning. *See Cent. Valley Chrysler-Plymouth v. CARB*, No. CV-F-02-5017 REC/SMS, 2002 WL 34499459, at *3 (E.D. Cal. June 11, 2002). The case was subsequently settled. *See* Agreement of Counsel Concerning the 2001 California ZEV Litigation, https://www.arb.ca.gov/msprog/zevprog/zevlitigation/zevlitigation.pdf.

[101] 42 U.S.C. §§ 32902(b)(2)(B) (emphasis added).

[102] *See* 49 U.S.C. § 32904(a)(2) (requiring the use of a petroleum-equivalency factor for electric vehicles); 10 C.F.R. § 473.3 (prescribing a generous petroleum-equivalency factor that incentivizes electric vehicles); *see also* Sanya Carley et al., A Macroeconomic Study of Federal and State Automotive Regulations 115 (Mar. 2017) ("The corporate averaging features of the federal CAFE and GHG programs are such that each [electric-vehicle] produced due to the ZEV regulation allows vehicle manufacturers to produce one or more less fuel-efficient vehicles than they would have produced without the presence of the ZEV regulation."); *id.* at 133 ("each ZEV produced for California will permit the manufacturer to produce one or more less fuel-efficient cars elsewhere in the country").

[103] *See Geier v. Am. Honda Motor Co.*, 529 U.S. 861, 881 (2000).

domestically produced renewable liquid fuels and natural gas, not just electricity.[104] California's ZEV standards undermine that congressional scheme by mandating the production of electric vehicles when Congress has decided to encourage a range of options.[105] By picking one technology over others favored by Congress, in a way that distorts auto manufacturers' decisions, the ZEV standards interfere with Congress' purpose of encouraging "the development and widespread use of methanol, ethanol, and natural gas as transportation fuels by consumers" and "the production of methanol, ethanol, and natural gas powered vehicles" through alternative-fuel incentives in the fuel economy program.[106]

CONCLUSION

High-octane, midlevel ethanol blends would increase efficiency, reduce CO_2 emissions, and lower vehicular pollution. EPA should support high-octane midlevel ethanol blends by approving a certification fuel and removing other regulatory barriers that impede the sale and use of these fuels.

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[104] *See* 49 U.S.C. § 32905 (prescribing a 0.15 divisor for liquid alternative fuel vehicles and natural gas-fueled vehicles). 10 C.F.R. § 473.3 (prescribing the same 0.15 divisor for electric vehicles).

[105] *Cf. Geier*, 529 U.S. at 881 (holding that any rule of state tort law imposing a duty to install airbags was preempted by the National Traffic and Motor Vehicle Safety Act of 1966 and by DOT's implementing regulations, because the tort law would present "an obstacle to the variety and mix of devices that the federal regulation sought").

[106] Alternative Motor Fuels Act of 1988 § 3, Pub. L. 100–494, 102 Stat. 2441, 2442.