Comments of

Clean Fuels Development Coalition
Environmental and Energy Study Institute
Farmers Union Enterprises
Governors' Biofuels Coalition
Minnesota Farmers Union
Montana Farmers Union
National Farmers Union
Nebraska Ethanol Board
North Dakota Farmers Union
South Dakota Farmers Union
Urban Air Initiative

On

Proposed Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks

Department of Transportation (DOT)
National Highway Traffic Safety Administration (NHTSA)
49 CFR Parts 523, 531,533, 536, and 537

Environmental Protection Agency (EPA)
40 CFR Parts 85 and 86

[NHTSA-2018-0067; EPA-HQ-OAR-2018-0283; FRL-9981-74-OAR]

Advanced Notice of Proposed Rulemaking and Draft Regulatory Impact Analysis

Submitted To EPA: October 26, 2018

Introduction and Summary

The commenters[1] appreciate this opportunity to comment on the U.S. Environmental Protection Agency (EPA) and U.S. Department of Transportation/National Highway Traffic Safety Administration's (DOT/NHTSA) proposed Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule. We commend the agencies for acknowledging the potential benefits of high octane fuels for improving fuel efficiency and reducing carbon emissions to also provide safe air quality and a healthier society.

> **DOT/NHTSA's Notice of Proposed Rulemaking NPRM:** *"In anticipation of this proposed rulemaking, organizations such as the High Octane Low Carbon Alliance (HOLC)… have shared their positions on the potential for making higher octane fuels available for the U.S. market. Other stakeholders also commented to past NHTSA rulemakings and/or the Draft TAR regarding the potential for increasing octane levels for the U.S. market. In the meetings with HOLC…the groups advocated for the potential benefits high octane fuels could provide via the blending of non-petroleum feedstocks to increase octane levels available at the pump. The groups' positions on benefits took both a technical approach by suggesting an octane level of 100 RON is desired for the marketplace, as well as, the benefits from potential increased national energy security by reduced dependencies on foreign petroleum."*[2]
>
> **EPA's NPRM:** EPA noted that a number of stakeholders urged 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."* Quoting here from the EPA NPRM: ***"EPA requests comments on if and how EPA could support the production and use of higher octane gasoline consistent with Title II of the Clean Air Act." 83 Fed. Reg. 43464.***
>
> **Ideal Octane Level:** In their proposed SAFE Rule, EPA and NHTSA asked for comment on the "benefits and dis-benefits of requiring higher octane fuels, such as E30 blends." Specifically, the agencies asked ***"What is an ideal octane level for mass-market consumption balanced against cost and potential benefits?"***

We strongly believe that the "ideal octane level" to optimize LDV performance, fuel efficiency, and reduce harmful emissions and consumer costs is 98–100 RON produced with E30+ "clean octane". In fact, we believe it is the **only** legally permissible way to make high octane fuels "consistent with Title II of the Clean Air Act."

EPA's reference to higher octane gasoline being "consistent with Title II of the Clean Air Act Amendments of 1990 (CAAA)" is extremely important because Title II includes Section 202(l) which specifically includes a mandatory provision adopted after months of extensive debate. Congress directed the EPA to reduce emissions of mobile source air toxics (MSATs) "to the greatest achievable extent, as technologies presented themselves." Congress formally banned the use of tetraethyl lead (TEL) in the CAA, which petroleum refiners had used for decades to boost gasoline octane ratings. However, Congress was acutely aware that refiners were planning to replace poisonous TEL with toxic/carcinogenic aromatic compounds (i.e., Benzene, Toluene methylbenzene,

---

[1] Commenters include an informal collaboration of organizations supporting the Clean Octane Alliance. For 30+ years, the Clean Fuels Development Coalition (CFDC) has represented automakers, ethanol producers, and state government entities committed to promoting the production and use of cleaner transportation fuels. The Environmental and Energy Study Institute (EESI) was founded in 1984 by a bipartisan group of members of Congress to inform the debate and decision-making on energy and environmental policies. For 30+ years EESI has been an educational resource for policymakers, an information conduit between federal, state, and local stakeholders, and a catalyst for partnerships and solutions. The Urban Air Initiative is a social welfare organization dedicated to educating the public about health threats posed by current gasoline formulation, and to take positive steps to reduce such threats by encouraging improvements in the formulation and combustion of such fuels. The National Farmers Union and its state chapters is a grassroots organization with more than 180,000 members, committed to advancing the interests of family farmers, rural economies, and protecting the soil and environment.

[2] *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks*, Notice of Proposed Rulemaking, Department of Transportation [49 CFR Parts 523, 531, 533, 536, and 537] and Environmental Protection Agency [40 CFR Parts 85 and 86], p. 129.

Ethylbenzene, and Xylene dimethylbenzene, or commonly referred to as BTEX), which many experts warned posed even greater dangers to the environment and public health and welfare.[3]

These comments focus on two of our priorities. They also provide a Regulatory Reform Roadmap of actions EPA can take to remove the market barriers in the way of achieving those priorities (See Appendix A).

1. We request that EPA update its 2007 Mobile Source Air Toxics (MSAT) Rule cost–benefit analysis. When updated, it should prove the benefits of using high octane low carbon mid-level ethanol blends like E30 will far exceed the costs; and

2. We believe that EPA should delete the section of its Preliminary Regulatory Impact Analysis (PRIA) which wrongfully contends that the near-term transition to higher octane gasoline would impose additional costs on consumers who drive legacy vehicles that currently use regular unleaded 87 AKI octane fuel.

Research dating back to 1906 confirms that adding any percentage of fuel ethanol to conventional gasoline (i.e., splash blending) will increase its octane, reduce the emissions, and deliver cleaning and cooling properties to enhance engine performance. For the purpose of these comments and to ensure consistency with referenced cost – benefit and emissions data, we will use 30% ethanol (i.e., E30) as our baseline definition of a high octane low carbon midlevel ethanol blend.

Commenters recognize there are benefits and additional data on other midlevel ethanol blends such as E15, E20, E25, and up to E50+. However, the benefits are not linear based on volume, and there is a point of diminishing returns. An extensive body of scientific literatures identifies E30 as "the sweet spot" blend that balances ethanol's octane power density credits with its energy density debits. Ethanol's unique and extensive range of benefits includes superior octane properties, lower cost, improved trade balance, substantial reductions in the most harmful mobile source toxic (MSAT) emissions, auto manufacturing cost savings, and improved engine performance and reduced tailpipe carbon emissions.

In recent years, independent research and "real-world" demonstration projects are proving that E30 can provide substantial near-term benefits to owners of the light-duty vehicles (e.g., legacy LDVs) on the road today. Those benefits will mount steadily as the LDV fleet turns over as consumers purchase "optimized" (i.e., higher compression, turbocharged) advanced engines that will require higher octane fuels. The bad news for some other low carbon technologies is that the fleet takes about 17 years to turnover. The good news for consumers and the nation is by 1990 automakers were recommending the use of ethanol because they had a decade of experience with these blends and a clearly CAAA defined path to cleaner fuels. In short, the U.S. LDV fleet is now ethanol-ready.

It is critically important to distinguish E30 from gasoline whose octane is primarily enhanced by carbon-intensive, toxic/carcinogenic aromatic hydrocarbons which petroleum refiners synthesize from crude oil by way of an energy-intensive "reforming" process. Since the elimination of leaded gasoline in the 1980s, petroleum refiners' preferred octane enhancers have been the aromatic hydrocarbon/BTEX compounds which are added to or are produced in the process of making gasoline. Best available science confirms that aromatic/BTEX compounds are toxic, carcinogenic, and mutagenic and are the predominant source of the most dangerous urban emissions.

[3] Senate Environment and Public Works Committee report on S. 1894, *The Clean Air Standards Attainment Act of 1987,* which underscored EPA's intentions to permit much higher levels of gasoline aromatics: *"Since 1973, the Agency has recognized that as the use of lead was restricted, the aromatic hydrocarbon content of gasoline would increase. In 1971, the average aromatic content of the total U.S. gasoline pool was 22 percent. By 1987, this average aromatic content had increased to 37 percent. The Agency has recognized this increase and has proposed increasing the test fuel aromatic content to 45 percent."* (P. 298).

These comments will provide evidence to support the following assertions:

1. A timely and practical transition to a national 98-100 RON high octane standard (i.e., 100 RHOS) using E30 would generate hundreds of billions of dollars in net benefits to taxpayers, automakers and other industries, the private/public sector health care system, and consumers/taxpayers over the life of this rule. Unlike the transition from leaded to unleaded, the transition from 87 octane 100% gasoline (E0) to E10 over the last decade has gone largely unnoticed by the consumer. U.S. motorists have driven over 10 trillion miles on E10 gasoline without any documented issues related to ethanol in the fuel and saved over $20 billion by using 87 AKI E10 compared to 87 AKI E0.[4]

2. Ethanol is the only octane boosting additive that contributes the full spectrum of national societal benefits that include: consumer savings; reduced emissions and health costs; better fuel efficiency and vehicle performance; reduced oil imports; improved trade balance; rural economic stimulus; taxpayer savings; and more competitive gasoline markets. Comparatively, if this final rule maintains the status quo side of the ledger, it will impose severe penalties on consumers, the environment, and public health. Transitioning to higher octane fuels without E30 will cost consumers an additional 20% or more at the pump, impede automakers' ability to introduce advance engine technologies, and substantially increase MSAT emissions due to higher gasoline aromatics/BTEX levels.[5]

3. EPA's most recent CAAA cost-benefit analysis calculated $2 trillion in net savings. EPA has estimated the SAFE rule will generate $500 billion in savings. A national 100 RHOS with E30 would nearly double those benefits.

4. The successful transition from leaded to unleaded gasoline will serve as a useful precedent for the transition to a 100 RHOS.

5. The reduced gasoline costs and public health benefits could immediately accrue to owners of the light-duty vehicles (LDVs) on the road today, and will increase substantially over time as automakers introduced higher compression advanced engines that require clean high octane fuels.

6. If fuel quality is not improved by reducing gasoline aromatic/BTEX levels, advanced engine technologies such as direct injection (DI) will exacerbate MSAT emissions. In the 1990 CAA (Title II), Congress directed EPA to ensure that fuel providers share the burden with automobile manufacturers in protecting Americans' health by reducing MSATs in the least cost, highest value manner to consumers, and the economy.

7. Ethanol is currently available at every wholesale gasoline terminal and retail station. There are no technological, infrastructural, economic, or legal barriers to transitioning to a 100 RHOS using E30 fuels. However, there are some—what many experts say are ill-advised, even illegal—regulatory barriers remaining which EPA has the authority/obligation to remove.

8. It is well past time for EPA to update and correct the obsolete and indefensible cost–benefit analysis (CBA) it used in the 2007 MSAT Final Rule. As explained below, EPA's conclusions were based on fallacious factual predicates. EPA senior officials have conceded that new science requires the agency to revisit the mandatory Congressional directives in Section 202(l) requiring EPA to reduce MSATs to the "greatest achievable extent." Comments and research validating assertions 1-6 above will illustrate how E30 fuels would be consistent with the Congressional directives to control gasoline aromatics/BTEX and MSATs.

[4] Based on a DeFour Group analysis of Energy Information Administration and Oil Price Information Service data submitted in EPA Comments Docket ID No. EPA-HQ-OAR-2015-0827: Reconsideration of its Determination on the Appropriateness of the Post-2022 GHG Tailpipe Emission Standards

[5] Ibid, page 14

9. Transitioning to E30 (a fuel which EPA cited as "preferred" for its advanced engine patent) would complement, not compete with, the gradual transition to electric vehicles (EVs), which will require decades or generations to reach commercial scale. Many experts assert that the ideal vehicle of the future would be an electric/E30+ hybrid.

10. Ethanol's approximately 130 RON octane value makes it uniquely capable of facilitating refiners' and regulators' ability to harmonize the SAFE rule with mandatory provisions in existing law: 1) upgrade refiners' 84 AKI sub-octane blendstock to 100 RHOS; and 2) substantially reduce gasoline aromatic/BTEX content, as much as 60% or more.[6] At the same time, 100 RHOS E30 fuels will also saves consumer money at the pump, and will not interfere with refiners' crude slates or require them to radically revise their blendstock for oxygenate blending (BOB).

We believe EPA/OTAQ has the mission jurisdiction/legal obligation, full statutory authority, and moral obligation to act promptly on the attached Regulatory Reform Roadmap. The roadmap is outlined below. By taking these actions EPA will stimulate and protect free market and fair trade, remove anti-competitive regulatory barriers restricting market access, and restore confidence and integrity to the oversight of programs designed to protect the public health and welfare. (See Appendix A for a more details).

1. Establish a Timely Transition Plan to reach Minimum Octane Standard of 98-100 RON
2. Correct its Misinterpretation of 211(f) Substantially Similar Rule
3. Amend/Modify the REGS Rule and/or officially strike from the Unified Agenda. (See details provided in Appendix B)
4. Extend the 1 psi RVP waiver for E10 and E15 to Higher Blends
5. Approve a Mid-Level Ethanol Blend Certification Fuel
6. Update and Reform EPA's MOVES2014 Model
7. Update EPA's 2007 Mobile Source Air Toxics (MSAT) Cost-Benefit Analysis (CBA)
8. Update and Reform EPA's Corn Ethanol Life Cycle Analysis (LCA)
9. Comply with the Toxic Reduction Provisions in Section 202(l) of the CAAA
10. Reinstate Credits for Automakers Producing Engines Optimized for High Octane (EOHO) like 100 RHOS using E30

These comments will show that no other additive or method for enhancing gasoline octane ratings can come close to providing the myriad societal and national policy benefits that ethanol's superior octane properties E30 can bring to the United States. The benefits of a 100 RHOS include: consumer savings; improved environment and reduced health costs; improved trade balance; reduced auto industry compliance costs; improved vehicle performance and fuel efficiency; agricultural sector stimulus and quality job creation; and substantial reductions in oil imports and improved energy and personal security.

Comments

Since the EPA was established, Congress has passed fourteen separate major legislative and/or regulatory actions that created, extended, or otherwise supported the production and use of ethanol because those actions specifically addressed the dangers of our nation's dependence on petroleum. Every U.S. President since Jimmy Carter has supported ethanol because it helps achieve some of our most important energy, environmental, economic, agriculture, and national security policy objectives. For all these reasons, E30 high octane blends enjoy broad bipartisan support.

[6] Hirshfeld et al., *Refining Economics of U.S. Gasoline: Octane Ratings and Ethanol Content*, Environ. Sci. Technol. 2014 Oct.7; 48 (19): 11064-71, Table 2, p. 11068. ["Reduced BOB volume (from displacement by ethanol) and lower BOB octane could lower refinery CO_2 emissions 10% for 100-RON E30…and reduce crude oil use…8% for 100-RON E30."]

For example, the widespread use of E30 has been endorsed by former Senate Majority Leader Tom Daschle[7], current Nebraska Governor Pete Ricketts (and former Chairman of the Governors' Biofuels Coalition)[8], former U.S. Department of Energy Secretary Ernie Moniz[9], and former White House Counsel to President George H.W. Bush, C. Boyden Gray[10]. For several years, automakers have urged EPA to encourage widespread use of higher octane gasoline containing ethanol because their research shows it will save manufacturing costs and enable the production of advanced higher compression engines optimized to use ethanol and its high octane. Today, we believe that the extensive body of science, comparative economic analyses, 40+ years of market place experience and consumer acceptance, and the evolving science of the public health threat of MSATS has created a sense of urgency for using the SAFE Rule to forge a pathway towards a national 100 RHOS/E30 standard.

Background on Octane

Higher octane gasoline has been a top priority of auto manufacturers and fuel producers for the past 100 years. A recent study by Oak Ridge National Laboratory (ORNL) fuel experts traced the 100 year evolution of gasoline octane number and spark-ignition engines. They noted that "…historically fuel octane number has been an enabler for increases in fuel economy or performance through engine compression; however, since the mid-1970s fuel octane number has remained stagnant." The authors state that "…with the looming emphasis on unprecedented increases to fuel economy in the current CO_2 age, it is hard to argue that the current stagnant fuel octane number can be sustainable over the long term. Therefore, increasing fuel octane number offers significant motivation to achieve fuel economy and CO_2 targets, which continue to be of primary concern".[11] (Emphasis supplied.)

An extensive body of best available science from automotive, U.S. Department of Energy national labs, and petroleum refinery, and regulatory experts confirms that the more ethanol is added to market-grade gasoline, the better vehicles perform in terms of both fuel efficiency and emissions reductions. In other words, E30 is better than E20.[12][There is a point of "diminishing returns"—where ethanol's octane "power density" benefits may be offset by its "energy density" demerits, e.g., lower BTU content, approximately E50.]

Importantly, Oak Ridge experts point out that E30 enable improvements go beyond their higher octane number*:*

> *"…intermediate gasoline alcohol blends, like E30 have reduced combustion duration." Recently studies "…have shown improved dilution tolerance of similar E30 fuels over reference fuels and gasoline. Beyond flame speed and dilution tolerance effects, [E30] blends have been shown to exhibit reduced combustion temperatures and increasing engine efficiency…these combined studies illustrate that the potential to increase engine performance and fuel economy offered through [E30] blends extends beyond octane number alone."*[13]

---

[7] https://www.dtnpf.com/agriculture/web/ag/news/world-policy/article/2018/05/14/former-author-rfs-legislation-sees. "The sweet spot for octane is 98 to 100 and I think that opportunity is right in front of us, and the beauty of it is we don't need legislative authorization," Daschle said.

[8] *"EPA Approves E30 Pilot for State of Nebraska Vehicles,"* Ethanol Producer Magazine, Office of Governor Pete Ricketts, September 26, 2018: "Thank you to acting EPA Administrator Andrew Wheeler and his team for approving Nebraska's E30 pilot project," said Governor Ricketts. "We look forward to piloting the use of Nebraska-grown and produced E30 in state vehicles."

[9] Interview with U.S. Secretary of Energy Ernie Moniz**,"** Energy secretary: U.S. must be energy independent" *The Des Moines Register*, *Donnelle Eller, May 7, 2016*:*"There's no technology miracle needed. We know how to do it. We know it's not very expensive…Our laboratory analyses have indicated that something like a 30 percent mixture is optimal.*

[10] Matthew L. Wald, "Squeezing more from ethanol", *New York Times*, May 3, 2013: "In coming years, Mr. Gray and others say, more cars are going to be engineered for high-octane fuel so they can get better fuel economy as automakers move to double economy, and high-octane fuel with 30 percent ethanol is cleaner than blends relying more heavily on gasoline."

[11] Splitter et al., "*A Historical Analysis of the Co-evolution of Gasoline Octane Number and Spark-Ignition Engines*", Frontiers in Mechanical Engineering, January 2016, Volume 1, Article 16.

[12] Thom G. Leone et al., *The Effect of Compression Ratio, Fuel Octane Rating, and Ethanol Content on Spark-Ignition Engine Efficiency*, Environ. Sci. Tech. (2015), Table 2, p. 10785. [101-RON E30 fuel with downsizing yields a total efficiency gain of 7% and a reduction in tailpipe CO_2 emissions of 7%, compared to 4.0% and 4.1% respectively for a 96 RON E20 fuel.]

[13] Supra Splitter, p. 15.

Refinery experts have noted the substantial octane contributions ethanol has made to the nation's gasoline pool in the short time since enactment of the first RFS. As ethanol's share of the market has grown, refiners have reduced their gasoline blendstocks' octane ratings, and ethanol's octane contribution has increased dramatically.[14]

Refinery experts have also analyzed the comparative contributions of the leading octane enhancing candidates, and identified the primary barriers to their increased contribution. While the other oil-derived candidates are limited by refinery or other technical constraints (e.g., insufficient octane boosting properties), ethanol's only constraint is "regulatory", and attributable to EPA's unnecessary and/or illegal barriers.[15] (See Appendix C)

Cost-Benefit Analysis of High Octane Low Carbon Fuels Standard Using E30

In their proposed SAFE Rule, EPA and NHTSA asked for comment on the "benefits and dis-benefits of requiring higher octane fuels, such as E30 blends". Specifically, the agencies asked ***"What is an ideal octane level for mass-market consumption balanced against cost and potential benefits?"***

We strongly believe that the "ideal octane level" to optimize LDV performance, fuel efficiency, and reduce harmful emissions and consumer costs is 98 – 100 RON produced with E30+ "clean octane." In fact, we believe it is the **only** legally permissible way to make high octane fuels "consistent with Title II of the Clean Air Act".

We understand that others feel differently, including an informal coalition of oil interests and automakers who are promoting a legislative package that would stipulate a minimum standard of 95 RON.

Representatives of several automakers have been circulating a proposed "Legislative Reform" package on Capitol Hill which proposes a minimum 95 RON national standard. The proposal identifies several potential "pathways" to reform the current U.S. transportation fuels system: 1) the Ag – Auto – Ethanol group's "regulatory reform" pathway; 2) an E15 commercialization "market" pathway; 3) the DOE Co-Optima pathway (effectively closed because DOE has dropped all emphasis on implementation); and 4) a "legislative" pathway (which would require "cooperation" amongst the various stakeholders, including support of the oil industry).[16]

However, we believe that there is another more viable, efficient, and legally permissible route: a SAFE Rule 98–100 RON gasoline standard which would be consistent with Title II statutory obligations and which the agencies have the authority, many experts say the legal obligation, to promulgate.

This automaker proposal asserts that the regulatory and market pathways are not viable because they require either "sympathetic regulators" or realization of "customer value" for higher octane gasoline in all markets[17]. The authors say that the "timing is now" because automakers cannot afford to wait—they "need to know octane will happen…in the current fuel economy rule timeframe (before 2025)."

Therefore, automakers appear to favor a legislative solution to secure a higher octane standard and have partnered with the oil industry in promoting a package of ill-advised reforms and are advocating the 95 RON "solution".[18] However, in addition to the huge challenges that confront legislative solutions in a grid-locked

[14] THiggins Energy Consulting, *Net Midstream on Refinery Midstream Octane Requirement,* OPIS Octane Value Forum, October 2017, p. 16. (See Appendix C)

[15] Id., p. 17.

[16] DiCicco, Guzzo et al., *CAFE, GHG, and HOF*, August 28, 2018.

[17] Id., slide 14.

[18] Id., slide 18.

Congress (especially with an issue this complex and controversial), many experts point out that a 95 RON solution would not be "consistent with Title II," as requested in EPA's NPRM.

There are many reasons for this, but one of the primary ones is identified on slide 23, where the automakers provide a "RON Analysis." They cite 95 RON as "the optimum octane for the E10 fuels," and note that "higher octanes are optimum for higher ethanol blends," e.g., 98+ RON. However, it is clear that the auto/oil collaboration envisages these "premium-grade" 98 RON fuels as "niche fuels," e.g., only 10–15% of the market similar to today's premium-grade.

Effectively, the proposed "legislative reform" solution would limit the vast majority of the U.S. gasoline market to E10 – E15 blends. Refiners want to cap the new national octane standard at 95 RON fuels, because they believe they can hit that target with BTEX and other oil-derived octane enhancers. [The past 40 years of ethanol-blending experience proves that petroleum refiners will opt for crude oil-derived additives if they are legally permitted to do so, even when they could have enjoyed substantial economic benefits by using more ethanol.] It took enactment of the Federal requirements in the first Renewable Fuels Standard (RFS) in 2005 to allow ethanol to compete in market riddled with a history of anti-competitive and unfair market practices that created and protected a nationwide gasoline mandate for 100+ years.

Even though the automakers urge EPA to "issue an updated interpretive rule defining 'substantially similar' for gasoline pursuant to CAA section 211(f) without reference to ethanol content,"[19] other sections of the "deal package" would prohibit the use of E15+ fuels in standard vehicles.

Another consequence of the 95 RON scenario is that we believe the refiner's real intention may have been revealed toward the end of the presentation, where the Flint Hills slide contains a neatly camouflaged "poison pill" for E30 100 RON fuels: "MSAT (Mobile Source Air Toxics) will continue to be controlled via benzene limits".[20] If enacted into law, it would amount to a clever back-door means of gutting Section 202(l)'s mandate to substantially reduce all of the non-benzene aromatics.

The chances of a legislative deal—even in the chaos of a lame duck session—are very remote. However, if this so-called "good faith framework" were ever enacted and implemented, the U.S. transportation fuels sector would never realize its full potential in terms of improving fuel efficiency, reducing the most lethal toxics and carbon emissions, reducing costs to the consumer, and improving the nation's trade balance and rural economy.

We believe that the proposed 95 RON octane solution does not comply with Title II of the CAAA. As proposed, this package would unnecessarily limit the significant fuel efficiency and carbon reduction benefits of an E30/100 RON national standard. It would also ensure that higher gasoline aromatics content used in DI engines would substantially INCREASE emissions of SOA-bound PAHs and other toxics. Refiners would use MORE crude oil, and there would be few if any trade balance benefits. Billions of dollars in farm sector benefits would be lost.

In the 1990 CAAA, Congress gave EPA clear instructions to require maximum achievable reductions in MSATs and other gasoline-related pollutants. As it was banning leaded gasoline for its horrible societal costs, Congress also specifically called out the serious health dangers of the gasoline aromatic compounds, benzene, ethyl-benzene, toluene, and xylene, commonly known as BTEX. It was widely understood petroleum refiners synthesize BTEX from crude oil to increase gasoline octane levels. Congress directed EPA to reduce MSATs and the gasoline BTEX that caused them to the "greatest achievable extent…as technologies presented themselves".

However, by the time of the 2005 Energy Policy Act—which included the first Renewable Fuels Standard (RFS)—EPA had not complied with the Congressional directive to substantially reduce gasoline BTEX content and MSATs. In fact, as gasoline consumption increased, and Americans drove more vehicles and miles, MSAT

[19] Id., slide 26.
[20] Id., slide 34.

emissions increased. Consequently, despite oil industry pressures to eliminate Section 202(l) requirements in the CAAA, Congress doubled down, and required EPA to take long overdue action on regulating toxic BTEX compounds, setting an eighteen month deadline.

EPA complied with the Congressional directive by promulgating a new rule in less than two years, but its 2007 MSAT Final Rule was deemed by many industry observers to be an incomplete and uninspired piece of work that relied upon antiquated data and that failed to honor Congressional intent. In the final analysis, EPA's MSAT rule concluded the only "cost effective" and "technologically available" action was to slightly reduce gasoline's benzene content (from 1.0 vol. % to 0.6 vol. %). It did nothing to reduce the rest of the benzene-laced aromatics "TEX" (i.e., Toluene methylbenzene, Ethylbenzene, and Xylene dimethylbenzene), which are converted into benzene and other harmful toxics and ozone precursors, and emitted out the tailpipe.

Today, BTEX aromatic hydrocarbons are the most toxic, energy and carbon-intensive, and most expensive octane enhancers. BTEX constitutes 25–30% of the U.S. gasoline pool—approximately 40 billion gallons every year.

EPA's factual predicates were obsolete and wrong ten years ago. Today, in order to properly inform the critically important decisions that are being made in the pending SAFE Rule, it is imperative that EPA produces a modernized, peer reviewed, and accurate CBA. There are a number of material changes EPA should make to correct its 2007 MSAT rule's incorrect factual predicates.[21] They include:

- Replace $19 per barrel crude oil with $70-$100 per barrel.
- Replace $.85 per gallon gasoline with $2.25 per gallon.
- Recognize that one gallon of ethanol replaces two gallons of aromatics/BTEX content in an "octane equivalence value."[EPA assumed the opposite in 2007.]
- Acknowledge that U.S. ethanol capacity is now in excess of 17 billion gallons per year, and that the industry is capable of expanding quickly if regulatory barriers are removed and the proper signals are provided.
- Acknowledge that conventional ethanol requires no federal tax exemption.
- Acknowledge the advancement in technology resulted in the explosion in corn yields and farming efficiency creating new science proving high-yield corn restores soil organic matter, and that corn acres are major carbon "sinks."[22] (See Appendix D)
- Acknowledge that E30 is lower a volatility fuel and does not deserve an RVP butane "penalty."
- Acknowledge that E30 used in optimized higher compression engines enable substantial improvements in fuel efficiency, reductions in carbon, and lower MSAT emissions.
- Acknowledge that E30 can be used in legacy vehicles without modification, and with no mileage penalty.
- Acknowledge that ethanol supplies are available nationwide and the distribution and refueling infrastructure can accommodate E30 in a timely way without major capital expenditures.
- Acknowledge the transition to electric vehicles (EVs) will be slow, that optimized liquid fuel-powered internal combustion vehicles running on higher octane low carbon fuels will be in service for decades, and that the same scrutiny used for ethanol's lifecycle carbon analyses should be applied to the electricity used in EVs.

[21] See Appendix II of the Urban Air Initiative Tier 3 Rule Comments, as well as Addendum A of the Urban Air Initiative et al. Midterm Evaluation Comments, EPA-HQ-OAR-2015-0827-9904 (August 21, 2017), *available* at https://bit.ly/2NgfiSZ.

[22] Commenters hereby incorporate as if fully stated herein, the peer-reviewed studies that document corn and corn ethanol's ability to capture and store carbon dioxide, and to reduce tailpipe carbon emissions as cited in C. Boyden Gray's comments on the Renewable Fuels Standard Program submitted on behalf of the Energy Future Coalition, Urban Air Initiative, CFDC et al. on the Renewable Fuels Standard Program: Standards for 2017, Docket ID No. EPA-HQ-OAR-2016-0004 (May 31, 2016). See also American Coalition for Ethanol White Paper - 2017, *The Case for Properly Valuing the Carbon and Sustainability Benefits of Corn Ethanol*, and Comments of The Clean Fuels Development Coalition et, al, *EPA's RFC on Reconsideration of the Final Determination of the Mid-term Evaluation of GHG Emissions Standards for Model Year 2022-2025 Light-duty Vehicles*, Docket EPA-HQ-OAR-2015-0827, October 5, 2017.

- Acknowledge that E30 and other higher ethanol blends do NOT increase formaldehyde emissions, and that Congress deliberately refused to target acetaldehyde emissions in Section 202(l) because of their very low potency compared to other MSATs.[23] (See Appendix E)

It is entirely unacceptable that in the 25+ years since the enactment of the Congressional MSAT reduction mandate, gasoline BTEX levels have been reduced by less than 1%.[24] Aromatics/BTEX is not only the primary source of the most dangerous urban air toxics, but also the dominant source of $PM_{2.5}$ secondary organic aerosols (SOAs), which carry the toxics long distances, and are major contributors to ground level ozone. EPA has projected that by 2020, 85% of the $2 trillion in savings from the 1990 CAAA will come from reductions in ambient PM, and that its models **under**-predict the amount of the fine and ultra-fine particulates that are caused by gasoline aromatics/BTEX.

If current trends continue (with EPA's primary focus on stationary source regulation), by 2020, mobile source carbonaceous material, will be responsible for as much as 90% of $PM_{2.5}$ emissions. Compounding this concern is the fact that EPA only regulates particle mass, and not particle numbers (PN), which overlooks the especially lethal ultra-fine particulates (UFPs). UFPs are especially dangerous, because they are coated with highly toxic materials (polycyclic aromatic hydrocarbons and quinones, PAHQs) which penetrate the lungs, and are carried by the bloodstream to the organs, where they cause a wide range of cancers, heart disease, asthma, and even DNA and mitochondrial cell damage. PAHQs themselves are combustion byproducts and oxidative derivatives of gasoline and specifically aromatic/BTEX components. Since they are emitted primarily by gasoline-powered vehicles, UFPs + PAHQs are found in their most elevated levels near congested roadways, where tens of millions of Americans have no alternative but to breathe the poisonous air. Unlike cigarette smoke, these toxic emissions are invisible, but their economic costs are enormous, and the human costs are unquantifiable.

EPA has acknowledged that its models seriously understate, in some cases ignore, the contributions gasoline/aromatics/BTEX makes to $PM_{2.5}$, and said it would account for secondary organic PM from "gaseous toluene emissions" that year.[25] EPA promised in its original 2011 CAFE-GHG rulemaking that it would correct its models. It has failed to do so.

EPA's reasoning for not regulating $PM_{2.5}$ SOAs and UFPs caused by gasoline exhaust is "modeling uncertainties." However, it is also clear that the uncertainties do not arise from whether aromatics/BTEX contributes to PM, toxics and ozone, but simply to what degree.[26] EPA has confirmed that aromatics/BTEX is solely responsible for the organic aerosol formation potential of gasoline, and that aromatic compounds are responsible for 50–70% of the aerosols in many air sheds.[27] A 2007 southern California study found that up to 80% of the ambient ultra-fine particulate emissions were secondary organic precursors from gasoline exhaust and vapors.[28] The science has now advanced sufficiently for EPA to act.

Finally, unless gasoline aromatics levels are reduced, advanced engine designs such as direct injection will make UFP emissions **worse**, according to groups like the Health Effects Institute (HEI) and California Air Resources Board (CARB).[29] This concern has been echoed by numerous other subject matter experts, including automotive engineers and elite medical universities. For example, a 2010 Honda SAE paper identified Aromatics Group

[23] See BGA/UAI MOVES Model RFC.

[24] http://www.energyfuturecoalition.org/files/webfmuploads/EFC_RFS_Comment_Nov_2006.pdf, Appendix B of their comments, p. 12

[25] http://www.epa.gov/air/sect812/prospective2.html, see esp. pages 4-24-25, and Table 5-3 on p. 5-13.

[26] 2007 EPA PM Implementation Rule, pages 72 Fed Reg 20592-93 "Policy for VOC"

[27] Energy Future Coalition comments, supra, p. 33

[28] Brown, et al; "Source apportionment of VOCs in the Los Angeles area using positive matrix factorization," Atmospheric Environment, Vol. 41, Issue 2, January 2007, pp. 227 - 237

[29] http://www.arb.ca.gov/msprog/levprog/leviii/meetings/030210/lev_iii_discussion_paper_2-10.pdf, p. 10.

compounds as the primary source of PN/PAH emissions, and warned that the necessary reductions cannot be achieved without combining fuel quality improvements with advanced engine technologies.[30]

Table 1 illustrates how hundreds of billions of dollars in annual health, crude oil imports, and trade balance savings could be realized if EPA were to exercise its authorities under Title II of the CAAA to substantially reduce gasoline/aromatic/BTEX/MSAT emissions. A gradual phase-down in gasoline's aromatic/BTEX content using E30 could save the public and private sectors more than $400 billion per year by 2025 – by our estimates – which does not include the $500 billion EPA estimate which does not include an E30 baseline.[31] A SAFE Rule that includes a roadmap to 100 RHOS would unleash market forces, increase competition in the U.S. fuels market, generate billions of dollars annually in economic activity, and save thousands of lives while creating tens of thousands of quality jobs.

Cost Savings from E30 100 RHOS

In updating its new CBA, EPA should not repeat past errors. For example, one of EPA's most egregious mistakes was to rely upon extremely obsolete Energy Information Administration (EIA) pricing data from 1993 (e.g., $19 oil, $.85 gasoline, etc.). One expert recently warned that EPA may be considering using EIA data from its AEO 2018 forecasts which project an ethanol price in excess of $2.50/gallon in 2018/19 due to a so-called "RIN Bump." This amounts to a "phantom" price increase of approximately $1 or more per gallon. However, as former GM executive Dean Drake's slides illustrate the "RIN Bump is not Real."[32] (See Appendix F).

Once derided as wild speculation, it is now widely accepted that ethanol's displacement and octane boosting contributions to the U.S. gasoline pool saves consumers money at the pump. For example, E30 was the reference fuel in the study "The Economics of Eco-Performance Fuel" which concluded that midlevel blends can save consumers $.66 per gallon and lower crude oil prices by 1.14%. Other study data show a higher octane standard using E30 could reduce in automaker manufacturing costs by about $500 per vehicle and save another $900 on operating cost, for a combined savings of about $1,400 per vehicle – or 1/12 the cost of electric vehicles.

> *"At the time of this study, E-10 was $0.058 per gallon less expensive than a pure 87 AKI gasoline on an energy-equivalent basis. Thus, adding 10% ethanol to gasoline saved consumers an estimated $8 billion in 2013. Adding an additional 20 percent ethanol to this 10 percent mixture to create eco-performance fuel (EPF) would result in a gasoline with an octane rating equivalent to today's premium grade gasoline (93 AKI) but cost about $0.09 a gallon less than today's regular grade gasoline based on the level of ethanol production and fuel prices at the time of this study.*
>
> *Assessments by others of future ethanol prices indicate that EPF (E30) should be even less expensive in the future. It also appears that this should hold true even at the larger volumes of ethanol required for EPF (E30), although this needs to be further studied. Testing has indicated that by boosting the compression ratio of a spark ignition engine, the resulting fuel economy on EPF (E30) would be equal to or greater than a conventional engine run on regular gasoline and have 7 to 11% lower GHG tailpipe emissions. Only when ethanol is used in higher blends as a gasoline substitute in vehicles such as flex-fueled vehicles is there a positive cost to using ethanol over gasoline. But even the highest marginal cost use of ethanol (to completely replace gasoline) is 1/12 the cost of the highest marginal cost means of improving fuel economy (electric vehicles).*
>
> *In addition to direct consumer benefits, the use of ethanol blends strengthens the nation's energy security. The first threat to energy security is the chronic drain on our economy that results from inflated energy prices due to monopoly pricing power. Biofuels are uniquely positioned to diminish OPEC's global pricing power because, unlike fuel conservation, biofuels*

[30] "Development of a Predictive Model for Gasoline Vehicle Particulate Matter Emissions,"Aikawa, et al., Honda R &D, SAE International, 2010-01-2115, published 10/25/2010.

[31] Commenters hereby incorporate as if fully stated herein, the peer-reviewed studies that document E30 high octane fuels' ability to reduce harmful emissions as cited in C. Boyden Gray et al., *Request for Correction of Information submitted on behalf of the State of Kansas, State of Nebraska, The Energy Future Coalition, and Urban Air Initiative Concerning the U.S. Environmental Protection Agency's EPAct/V2/E-89 Fuel Effects Study and Motor Vehicle Simulator Model (MOVES2014)*, Docket ID Nos. EPA-420-R-13-002, FRL-9917-26-OAR (Jan. 19, 2017).

[32] *See* Dean Drake, *Why Not Use EIA's Forecast Prices?* DeFour Group, Fuel Ethanol Workshop, June 2018, slide 10.

provide auto consumers the ability to quickly switch to alternative fuels when gasoline prices rise. It can be estimated that the value per gallon of conventional fuel displaced is $0.46 per gallon in 2014. A second threat to energy security occurs when a sudden surge in oil prices resulting from worldwide instability impacts the US economy adversely. The best estimate of this value perhaps is found in NHTSA's recent Final Regulatory Impact Analysis regarding the "2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards", which estimates a value of $0.20 per gallon.

Overall, this study concludes that the greatest positive impact to the economy using ethanol-gasoline blends would be to transition from E-10 to EPF (E30) in the same manner as the nation converted from leaded to unleaded gasoline in the 1970s. This study estimates that the resulting lower tailpipe CO2 emissions from vehicles optimized to use EPF (E30) would in 2025 reduce the average cost of a new vehicle by $500 and lifetime fuel costs by $900, with the potential to increase direct employment by over 170,000.[33]

Farm Economy and Job Creation Benefits

The fuel ethanol industry is making enormous contributions to the U.S. economy. In a recent *Wall Street Journal* op ed, Senators Chuck Grassley and Joni Ernst noted that *"Ethanol supports more than… 350,000 jobs throughout the country, directly and indirectly. Ethanol contributed $44.4 billion to gross domestic product and $5 billion in federal tax revenue in 2017."*[34] Transitioning to 100 RON E30 would double those numbers, improve farmers' income, and reinvigorate our rural economy, saving taxpayers billions in farm outlays as market forces make taxpayer support unnecessary.

Contrary to popular belief, producing ethanol from the starch portion of a bushel of corn does NOT drive up food prices to the consumer. In fact, ethanol facilities produce a concentrated high-value protein co-product, which along with corn oil-derived products, significantly reduce livestock industry demand for bulk corn, as they are more efficient rations.[35] Oil industry-funded "food vs. fuel" attacks during the 2008 oil price spike and global commodities boom distorted the facts, proof of which occurred several years later when corn prices plummeted while U.S. ethanol production doubled. Credible studies by U.S. and international organizations have confirmed that the 2008 food price increase was due almost entirely to the crude oil price spike (transportation and energy costs) and manipulations of commodity speculators.

Neither does corn ethanol contribute to international land use shifts. Official data confirms that as U.S. farmers' productivity increases year over year, more food and fuel is being produced on fewer acres, as precision agriculture and other technological advances reduce inputs on a per bushel basis.

Finally, as noted elsewhere in these comments, high-yield corn acres have been proven to be substantial carbon sinks by respected experts at the Argonne National Labs and by USDA scientists, due to its restoration of soil organic matter above and below ground. As corn yields continue to increase dramatically, corn's carbon sequestration benefits will continue to grow, and ethanol produced from corn starch will continue to be lower cost than oil-derived octane competitors.[36]

[33] Air Improvement Resource, Inc., DeFour Group LLC, Transportation Fuels Consulting Inc., *The Economics of Eco-Performance Fuel*, April 22, 2014

[34] Grassley and Ernst, *Trump Gives Farmers a Jolt of Fuel, Wall Street Journal*, October 17, 2018, A15.

[35] Ethanol Across America/Dave Vander Griend, *Producing More Food and Fuel with Less Carbon*, Summer 2009.

[36] Supra footnote 21, American Coalition for Ethanol White Paper, see Figure 9.

Table 1

National 100 RHOS With E30: $500 Billion/Year in Net Benefits

Primary Expenditure Categories	Conventional Gasoline	E30[A]	Estimated Annual Cost Savings
Mobile Source Air Toxics (Benzene, Toluene, Xylene, polycyclic aromatic hydrocarbons and quinones)	Primary source of urban air toxics[B]; PAHQs coat the Ultrafine particulates, and carry up to 2,500 meters	**75% reduction**	$24+ billion
Secondary organic aerosols (SOAs)/Ultra-fine particulates (UFPs)	90% by 2022[C]	**70% reduction**	$260 billion
VOCs & NOx		**8% & 6%[D]**	TBD
Carbon Monoxide	90%	**22 - 50%[E]**	TBD
Carbon Emissions	25%	**40–80[F]**	TBD
Crude Oil/Trade Deficit	50%?	**3.5 million b/d less**	$90Billion[G]
Farm Sector Benefits	None		$100+ billion???

Sources

A. For purposes of this analysis, E30+ blends are assumed to replace no less than 60% of gasoline aromatics (from the current average of 25 vol. % to 10 vol. %), by replacing aromatics with very low sulfur high-octane ethanol. When used at levels of 30% and higher, ethanol also reduces gasoline volatility, thus reducing and/or eliminating the need for RVP debits. A 2010 CARB study found that E35 – E85 blends reduced PN emissions by more than 90%, (see 2010 Zhang, et al., study, "A Comparison of Total Mass and Particle Number Emissions of Light Duty Vehicles from 2009 to 2010", p. 19.)

B. Aromatics/BTEX VOC emissions are also the primary source of SOAs and other precursors of ultra-fine particulate emissions and polycyclic aromatic hydrocarbons in urban air sheds, as well as significant contributors to ground level ozone formation.

C. Toluene/aromatics is now recognized by the EPA as the primary man-made source of SOAs. New science and measurement techniques that enable apportionment of Nano-sized ultra-fine particulates (UFPs) also confirm that gasoline, not diesel fuel, is the primary source of urban UFPs. See EPA's Final Report on the Costs and Benefits of the 1990 Clean Air Act Amendments, pages 4-24-25 and Table 4-1, full report at http://www.epa.gov/air/sect812/prospective2.html. [EPA PM2.5 calculation = $100 billion savings for each microgram per cubic meter reduction.]

D. EPA RFG Complex Model, as cited in Energy Future Coalition's comments on EPA's Proposed MSAT Rule, EPA-HQ-OAR-2005-0036, May 30, 2006, p. 46.

E. Supra, p. 46. Also, the 1997 OSTP report found that "vehicle CO emissions are reduced from 2 to 10 percent per percent of oxygen in the fuel". E30 blends contain approximately 10 wt. % oxygen.

F. Aromatics are at least 20% more carbon intensive than gasoline itself, and the EPA has determined that ethanol reduces GHG emissions by 21 – 80% compared to gasoline, depending upon feedstocks used and production methods employed. Additionally, combustion and photo-oxidation byproducts of gasoline BTX, especially the UFPs, are up to three times more carbon intensive than coarse or fine particulates, see "Research findings on particulate air pollution from the Southern California Particle Center", 2006, Slide 21.

G. Calculation assumes a weighted average crude oil cost of US$70 per barrel, Cumulative reductions in crude oil usage of approximately 3.5 million barrels per day gasoline-equivalent (ethanol's volume displacement plus octane substitution enabling reduced reformer severity). At $70 crude oil (even though experts warn the $100 crude is just around the corner), a nationwide E30 standard would save nearly $250 million per day, or more than $90 billion/year.

H. Recognizes that each barrel of crude yields approx. 47% gasoline, assumes 31.0 billion gallons per year of ethanol in E30 or higher blends by 2025, credits ethanol's crude oil savings due to its higher octane reducing the significant gasoline yield loss that occurs due to aromatics production, and factors in E30's reduced volatility (no butane RVP debit) see http://www.nrel.gov/analysis/pdfs/44517.pdf, pp. 16 – 19.

An Updated Cost–Benefit Analysis of <u>Non-GHG</u> Health and Environmental Impacts is Imperative

In its 2016 TAR, EPA conceded that:

> *"It is important to quantify the co-pollutant-related health and environmental impacts associated with the GHG standards because <u>a failure to adequately consider these ancillary impacts could lead to an incorrect assessment of the standards' cost and benefits. Moreover, the health and other impacts of exposure to criteria air pollutant and airborne toxics tend to occur in the near term, while most effects from reduced climate change are likely to occur only over a time frame of several decades or longer.</u>"*[37]

Unfortunately, EPA did not follow its own advice—it failed to conduct the necessary cost – benefit analyses.

> *"However, there are several health benefit categories that EPA was unable to quantify due to limitations associated with using benefits-per-ton estimates, several of which could be substantial. For example, <u>we have not quantified a number of known or suspected health benefits linked to reduction in ozone and other criteria pollutants, as well as health benefits linked to reductions in air toxics</u>."*[38]

Notably, in his March 15, 2018 letter to South Dakota Farmers Union President Doug Sombke, Office of Transportation and Air Quality (OTAQ) Director Chris Grundler acknowledged the importance of light-duty vehicle fine particle and associated emissions: (See Appendix G)

> *"We agree that ambient levels of PM are a result of secondarily formed particles in addition to direct PM emissions, and that light-duty gasoline vehicles are important sources of the precursors to PM formation."*[39]

As noted previously, EPA has asked for comment on "***if and how EPA could support the production and use of higher octane gasoline <u>consistent with Title II of the Clean Air Act</u>."*** In the same letter, Grundler responded to Sombke's question about why EPA has not enforced the MSAT provision in Title II:

> *"With respect to Clean Air Act section 202(l), the EPA has acted twice under this specific authority, including the February 2007 rule that addresses the aromatic content of gasoline through required limits on benzene (72 FR 8428, February 26, 2007)…<u>While the EPA continues to look for opportunities to further reduce air toxics, as required by Clean Air Act section 202(l), we must also consider technological feasibility and costs, among other factors.</u>"*[40] (Emphasis supplied)

In his April 9, 2018 response, Sombke pointed out to Grundler that EPA used obsolete and fallacious factual predicates in its 2007 MSAT CBA to conclude that it would not be cost effective to substitute E30 "clean octane" fuels for BTEX/aromatic hydrocarbons to replace lost octane. However, Sombke noted that EPA left the door open in the 2007 MSAT rule to revisiting the matter:

> "*…EPA acknowledged that there may be compelling reasons to consider aromatics control in the future, especially regarding reduction in secondary* $PM_{2.5}$ *emissions, to the extent that evidence supports a role for aromatics in secondary* $PM_{2.5}$ *formation…However, in its 2010 RFS2 Regulatory Impact Analysis, EPA*

---

[37] *EPA Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025, Draft Technical Assessment Report (2016)*, Draft TAR, available at https://www3.epa.gov/otaq/climate/documents/mte420d16900.pdf p. 3-36.

[38] Id.

[39] *See letter from* Christopher Grundler, Director, OTAQ to Doug Sombke (March 15, 2018) provided in Appendix G

[40] Id.

acknowledged that 'toluene is an important contributor to anthropogenic SOA', and that 'mobile sources accounted for 70% of the total nationwide ambient concentration of toluene'."[41]

It is clear that EPA's Office of Transportation and Air Quality (OTAQ) used obsolete and fallacious data for its MSAT CBA comparative economics model. The underlying economics and technologies have undergone radical changes during that period, all of which inure to the benefit of ethanol's cleaner octane. Consequently, as emphasized prior, we respectfully urge EPA to use the SAFE Rule to encourage a thorough but timely update to its 2007 MSAT CBA which includes current and accurate pricing, octane values, and ethanol production rate data. Most importantly, EPA needs to ensure the use of updated and accurate octane equivalency factors by the U.S. Department of Energy national laboratory data (e.g., Oak Ridge National Laboratory, Argonne National Laboratory, etc.), and incorporate the dramatic progress that has been made in the nation's ethanol blending infrastructure, including terminals, wholesale price differentials, and legacy fleet compatibility.[42]

We commend Ambassador C. Boyden Gray, former White House Counsel to President George H.W. Bush, comments to EPA's original GHG rule:

> "*If EPA is going to rely on the CAAA to reduce mobile* CO_2*, it cannot ignore the same statute's requirements to reduce mobile source air toxics, especially if that reduction also reduces* CO_2*…EPA cannot under the CAA cause an increase of one form of regulated pollution that causes serious health problems by reducing another that does not.*"[43]

The Critical Importance of an Updated Cost–Benefit Analysis of Ethanol's Displacement of Gasoline Aromatics/BTEX

Federal law requires agencies to justify major rules like the SAFE proposal with thorough cost–benefit analyses (CBAs). CBAs include assessments of societal costs associated with harmful emissions. Recently, media reports have cited economists' criticism of EPA's attempt to redefine $PM_{2.5}$ health effects to justify its proposed changes to the previous administrations carbon rule.

- *"The authors of the rule had counted the health benefits from reducing particles in their justification for why the benefits of regulating greenhouse gases outweighed the costs of implementing it. The health benefits of cutting* CO_2 *become even more evident when paired with the "co-benefits" of cutting fine particles.*
- *This process of weighing the economic pluses and minuses of any particular rule is known, in EPA lingo, as a cost-benefit analysis. It's a key factor in determining whether a rule makes sense both in terms of its environmental and health benefits and in the costs it imposes on industry.*
- *Roughly half of the estimated benefits from reducing greenhouse gases at power plants comes from the accompanying reductions of fine particles. The Obama administration estimated that the Clean Power Plan would have $20 billion in climate benefits and an added $13 billion to $30.3 billion in benefits from reductions in particulates."*[44]
- *Since President Richard Nixon established the EPA nearly fifty years ago, Republican and Democratic Administrations have required their environmental regulators to consider the societal "co-benefits" that come*

---

[41] Letter from Sombke to Grundler (April 9, 2018): *("EPA Used Fallacious Predicates in it 2007 MSAT Rule Cost – Benefit Analysis. EPA justified its decision to restrict its controls only to the benzene molecule by conducting a cost – benefit analysis that relied upon wildly obsolete and, in many cases, just plain wrong factual predicates. These included the use of 1993 EIA projections of $19 oil, $.85 gasoline, and perhaps most egregious, the assumption that two gallons of ethanol "octane equivalent" are required to replace on gallon of toluene's octane equivalent. As you know, the exact opposite is true.")*

[42] Appendix II of the Urban Air Initiative Tier 3 Rule Comments, as well as Addendum A of the Urban Air Initiative et al. Midterm Evaluation Comments, EPA-HQ-OAR-2015-0827-9904 (August 21, 2017), *available* at https://bit.ly/2NgfiSZ.

[43] Comments of Boyden Gray & Associates PLLC to the NHTSA-2010-0131 and EPA-HQ-OAR2010-0799 Proposed Rule, 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, February 13, 2012, p. 7.

[44] "Economists see errors in government claims on pricing", *E & E News*, Anne C. Mulkern, August 7, 2018.

with their actions. Recently however, the Trump EPA has signaled that it wants to drop co-benefits from its CBA considerations.[45] *Commentators have pointed out that the Obama-era mercury rule considered the societal benefits of particulate matter reductions, just as did the Clean Power Plan. Many experts say that the "costs and benefits of any regulation should encompass the widest possible range of effects. This has been standard practice since the Nixon Administration, and rightly so."*[46]

Recognition of E30's ability to substantially reduce gasoline exhaust PM and SOA-bound toxics is especially appropriate, because failure to reduce gasoline BTEX content will directly INCREASE such emissions as advanced engine technologies dominate the fleet.[47] As Ambassador Gray pointed out, EPA should not be allowed to ignore the Title II mandates to control MSAT emissions in the same rule they are attempting to improve fuel efficiency and reduce carbon emissions.

In other words, the MSAT emission reductions from a nationwide RHOS standard will not be merely "co-benefits". They will be primary, direct, and mandated benefits that bring not only health, but enormous energy security/trade balance, farm sector, and economic benefits.

Benefits from Transitioning to 100 RHOS Using E30 Would Be Immediate and Substantial

Regrettably, EPA's Preliminary RIA distorts the facts at pp. 256, 257:

" 6.3.2.2.17.3 Potential of higher octane fuels. Automakers and advocacy groups have expressed support for increases to fuel octane levels for the US market and are actively participating in Department of Energy research programs on the potential of higher octane fuel usage.230,231 Some positions for potential future octane levels include advocacy for today's premium grade becoming the base grade of fuel available, which could enable low cost design changes that would improve fuel economy and CO_2. *Challenges associated with this approach include the increased fuel cost to consumers who drive vehicles designed for current regular octane grade fuel that would not benefit from the use of the higher cost higher octane fuel. The net costs for a shift to higher octane fuel would persist well into the future. Net benefits for the transition would not be achieved until current regular octane fuel is not available in the North American market, and manufacturers then redesign all engines to operate the higher octane fuel, and then after those vehicles have been in production a sufficient number of model years to largely replace the current on-road vehicle fleet. The transition to net positive benefits could take many years."*(Emphasis supplied)

In fact, the converse is true. E30 can be safely used in, and benefit, standard (non-flex fuel) vehicles on the road today.[48] Cars would operate more efficiently and with more power, dangerous tailpipe emissions would be substantially reduced, and consumers would save billions at the pump. For example, between 2008 and 2014 U.S. gasoline prices remained well above the three-dollar mark. Without ethanol's contribution to the finished gasoline pool, Merrill Lynch estimated gasoline prices could have been ***50¢ per gallon higher***. The Department of Energy also concluded that ethanol reduces retail gasoline prices and reduces crude oil demand which makes crude oil cheaper for the entire world.[49] Other studies show using E30 would save consumers 20 cents per gallon. Consequently, this portion of the RIA should be deleted from the final SAFE Rule RIA.[50]

---

[45] Bloomberg Opinion, *Trump's EPA plans to tie its own hands*, October 13, 2018.

[46] Id.

[47] Sadaf Sobhani, *Air Pollution from Gasoline Powered Vehicles and the Potential Benefits of Ethanol Blending: A Review of Particulate, Nitrogen Oxide, and Volatile Organic Pollution*, Energy Future Coalition/United Nations Foundation, October 2016.

[48] Id. Effective January 1, 2017, EPA adopted E10 (10% ethanol/90% gasoline) blends as the nation's "certification fuel". This means that ethanol is "substantially similar" under Section 211(f) of the Clean Air Act. EPA should correct its misinterpretation of that provision, and remove its regulatory barriers so that E30 high-octane fuels may be legally used in non-flex fuel (standard) vehicles.

[49] Impact of Ethanol Blending on U.S. Gasoline Prices, National Renewable Energy Laboratory, NREL/SR-670-44517, 2008.

[50] The Economics of Eco-Performance Fuel, Air Improvement Resource, Inc., DeFour Group LLC, Transportation Fuels Consulting Inc., April 22, 2014

EPA and the Office of Management and Budget (OMB) recently took a step in the right direction when they released a new Unified Agenda which "downgraded" the REGS Rule[51] (proposed in 2017) from "final order status" (November 2018) to "long term action – to be determined".[52] Commenters and other strongly opposed the REGS Rule for its proposed codification of EPA's prohibition of the use of E16+ fuels in standard vehicles.[53] For further discussion of this matter, see Appendix A, regulatory reform roadmap item #3.

A 100 RHOS Using E30 Would Substantially Improve the Nation's Trade Balance

> *"U.S. motorists consume more fuel than any other country in the world and overall demand nationwide hit a record 9.3 million bpd in 2017."* https://www.reuters.com/article/us-andeavor-us-m-a-marathon-petroleum/marathon-to-become-top-u-s-refiner-with-23-billion-andeavor-buy-idUSKBN1I1043

Gasoline aromatics/BTEX are not only the most toxic and expensive components, they are also the most energy-intensive fraction. Transitioning to a 100 RHOS would substantially reduce crude oil demand, save tens of billions of dollars per year in crude oil expenditures, and substantially improve the nation's trade balance by also expanding U.S. refineries' exports of finished petroleum products and the ethanol industry's protein co-products (used for livestock rations, etc.). Cumulative reductions in crude oil demand by moving from today's E10 blends to 100 RHOS with E30would save approximately 3.5 million barrels per day gasoline-equivalent (ethanol's volume displacement plus octane substitution enabling reduced reformer severity). Assuming $70 crude oil (even though experts warn the $100 crude is just around the corner), E30 would save nearly $250 million per day, or more than $90 billion/year.

U. S. petroleum product exports recently reached $20 billion/year, an all-time high. Transitioning to 100 RHOS with E30 would substantially increase that figure, and the net effect would be to dramatically shrink the U.S. trade deficit by as much as 20% or more.

Aromatics/BTEX is the Primary Source of the Most Harmful Pollutants

Best available science shows the predominant source of urban fine particulate matter ($PM_{2.5}$) and its associated toxics is gasoline exhaust, specifically the 25–30% of gasoline which is aromatics/BTEX-based compounds.

- In a 2010 SAE paper, Honda scientists reported that their predictive modeling "indicated that aromatics with a high boiling point and a high double bond equivalent (DBE) value tended to produce more PN emissions…all of the additional PN is considered a PAH…with a high boiling point or soot. The higher the boiling point hydrocarbon added, the more the PN increases. This trend is particularly notable with aromatic substances."[54]

[51] Renewables Enhancement and Growth Support Rule, 81 Fed. Reg. at 80831.
[52] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201810&RIN=2060-AS66
[53] Boyden Gray & Associates, *Comments of Urban Air Initiative et al., on the Environmental Protection Agency's Renewable Enhancement and Growth Support Rule,* 81 Fed. Reg.80828 (Nov.16, 2016), Docket ID No. EPA-HQ-OAR-2016-0041 (February 16, 2017).
[54] Aikawa et al., SAE International, *Development of a Predictive Model for Gasoline Particulate Matter Emissions*, 2010-01-2115.

Advanced Engine Technologies Can Exacerbate Harmful Emissions Unless Aromatics/BTEX Content is Reduced

"DISI engines can be more efficient…and also offer a performance benefit…However, DISI engines tend to make more PM than their port-injected counterparts, with PM mass levels exceeding those of diesels equipped with diesel particulate filters."[55]

EPA recently requested comment on its proposed changes to how it considers costs and benefits.[56] We agree with EPA that to be useful, properly done CBAs must be transparent, and informed by accurate scientific models that consider the most important cost/benefit factors affected by the proposed rule. Regrettably, EPA has admitted that it has failed to meet this test when it comes to the health burdens imposed by gasoline exhaust.

In its November 2016 Technical Assessment Review (TAR) of the GHG – CAFE rule, EPA noted that:

> *"The reduction in CO_2 emissions from Tier 3 gasoline is due in part to the reduced carbon content of Tier 3 gasoline relative to Tier 2 gasoline. This is largely due to a reduction in aromatics for Tier 3 gasoline that is reflective of nationwide trends in U.S. gasoline properties over the past four decades since aromatic content was last revised for gasoline used for EPA certification and compliance testing."*[57]

In fact, the primary reason why gasoline aromatic content has been reduced over the past four decades is only because Congress required EPA to do so, including the national renewable fuel standard (RFS) that resulted in nearly all gasoline sold in the U.S. containing 10% ethanol. This fuel quality standard enables refiners to reduce the octane level and aromatic/BTEX content of their gasoline BOBs.

Unfortunately, we believe the EPA—and specifically OTAQ—has failed to comply with Congressional directives set forth 1990 CAAA for more than 25 years. Many experts believe that EPA's failure to comply is vulnerable to judicial correction under Title II, and that OTAQ's regulatory barriers that have prevented the use of higher blends of ethanol such as E30 are illegal. See Appendix A for a Regulatory Reform Roadmap that would remove these anti-competitive regulations and save consumers and taxpayers billions of dollars by restoring competition to the gasoline marketplace.

Fuel Efficiency Benefits with E30

A vast, and growing, body of research and evidence demonstrates that higher octane midlevel ethanol blends can be used effectively and safely by the existing legacy fleet. Recently, BMW-owned MINI Cooper recommended that its owners use 93 AKI octane with E25. The BMW X-1 SUV has followed suit. A BMW spokesman said that the vehicles will be available in the U.S. and Canada, and that the move was made "due to the increasingly strengthened requirements for fuel economy. "He added that "It is Mini's intention that all new models will be E25 compatible."[58]

Automotive studies have concluded that "if all current fleet vehicles were recertified and re-flashed for premium certification fuel, a 0.5-2.5% increase in fuel economy might be possible."[59] (See Appendix H) Similar fuel economy

---

[55] Storey et al., *Ethanol Blend Effects on Direct Injection Spark-Ignition Vehicle Particulate Matter Emissions,* Oak Ridge National Labs, 2010-01-2129, 10/25/2010.]

[56] 83 Fed. Reg. 27,524 (June 13, 2018), "Increasing Consistency and Transparency in Considering Costs and Benefits in the Rulemaking Process", Docket ID No. EPA-HQ-OAR-2018-0107.

[57] *EPA Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025, Draft Technical Assessment Report (2016),* Draft TAR, available at https://www3.epa.gov/otaq/climate/documents/mte420d16900.pdf p.2-211.

[58] "Mini Cooper Shares E25 Know-How with BMW," Canadian Report on Fuel Ethanol, Vol. 6, No. 5, September 14, 2016.

[59] Supra #11, Leone et al., 10778-10789.

results were recently verified by the Glacial Lakes Energy (GLE) E30 Challenge. Without modifications of any type, 50 legacy (non-flex fuel) vehicles were carefully monitored with performance data logging devices supervised by certified professionals. Owners reported better power and performance, and no complaints were registered. Mileage performance was unchanged, in some case slightly improved, even though the engines' compression ratios were unchanged.[60] The aforementioned crude oil and gasoline displacement benefits would also generate immediate benefits to the nation's energy security and trade balance.

Emissions Reduction Benefits with E30

Even if used in non-optimized legacy LDVs, E30 would generate substantial reductions in the most dangerous benzene-based, PM, and other MSAT emissions. For example, a 2011 CARB study (Zhang et al.) found that E30+ blends reduced PN/PM and black carbon by 80+% in port fuel injection vehicles.[61] These are enormous reductions. A large portion of the U.S. LDV fleet consists of PFIs, and it takes years for the fleet to turn over. Consequently, a properly done CBA would conclude that the immediate use of E30 in legacy vehicles would save billions of dollars in health costs and premature mortalities, in addition to the reduced consumer costs.

A 2014 study by Ford Motor scientists[62] also reported substantial reductions in PN/PM and black carbon emissions from direct injection (DI) engines that used splash-blended E30 "clean octane" fuels. It is critically important to distinguish between "splash-blending" higher concentrations of ethanol to gasoline—in other words, simply adding additional ethanol on top of market gasoline—and "match blending," which is the method that EPA used in its EPAct studies and subsequent MOVES2014 models.

A 2002 NREL study reported that Brazilian "catalyst formulations" had been standardized to be similar to those in the U.S. market." Experts have noted that in 2001 automakers transitioned to the wide band O2 sensor which allowed them to remove the ethanol sensor.

The world's largest "mid-level ethanol blend legacy vehicle demonstration program" has been going on successfully in Brazil now for years. The Brazilian experience is also consistent with the 2012 DOE/Oak Ridge 120,000 mile study.

> **NREL:** *"(4) Based on Brazilian experience, it is likely that conventional gasoline catalysts can be used with higher ethanol blends. In recent years, catalyst formulations for 10% and neat (100%) ethanol vehicles in Brazil have been standardized to be similar to those in the U.S. market, indicating that conventional catalysts used in U.S vehicles could also operate on similar ethanol configurations (Szwarc 1999)."*

The NREL study also found that higher ethanol blends would improve catalyst efficiency to the 98–99% range, due to sulfur dilution. While EPA has recently lowered U.S. sulfur levels, higher ethanol and higher octane would also dilute aromatic/BTEX levels, which would assist catalyst performance by reducing deposits and other adverse after-effects they cause.

---

[60] Glacial Lakes Energy newsletter, October – December 2017, statement of Jim Seurer, CEO: "*Since May 2016, GLE has been leading a local effort to promote the use of higher ethanol blends via the "E30 Challenge". To say the least, our campaign has been a HUGE SUCCESS in proving to area auto-owners, industry peers, and government officials alike that using Premium E30 (30% ethanol with 94 octane) will lead to equal or better performance in ALL automobiles. At last count, the eight Watertown retail stations that offer Premium E30, have sold over 2 million gallons of the lower cost fuel over the past 18 months. THAT'S 2,000,000 GALLONS!!!! Viewed another way, if the average fuel economy on this usage is 18 MPG (miles per gallon), approximately 36.0 million miles have been driven by area motorists using Premium E30 without a single engine issue."*

[61] Zhang et al., *A Comparison of Total Mass, Particle Size and Particle Number Emissions of Light-Duty Vehicles Tested at Haagen-Smit Laboratory from 2009 to 2010,* California Air Resources Board, 2011.

[62] Maricq et al. (2012) *The Impact of Ethanol Fuel Blends on PM Emissions from a Light-Duty GDI Vehicle*, Aerosol Science and Technology, 46:5, 576-583, DOI:10.1080/02786826.2011.64878.

NREL: *"(5) Higher ethanol blends will have a positive effect on catalytic efficiency due to the dilution of sulfur. As increased amounts of ethanol are added, catalyst efficiency is improved from 75%-85% efficiency to 98%-99% efficiency (Barnes 1999)."*

Thus, EPA's and API's opposition to higher than E15 blends in legacy vehicles is not supported by best available science and millions of miles of real-world driving. Midlevel ethanol blends do NOT harm emissions control systems. Higher ethanol blends substantially reduce harmful emissions, rather than exacerbate them.

A New Interpretive Rule for Section 211(f) "Substantially Similar" Provision Is Needed to Facilitate an Orderly Transition to a National 100 RHOS

It is also imperative for EPA to update its outdated and insupportable interpretation of the Section 211(f) "substantially similar" provision which improperly limits the concentration of ethanol permissible for blending into gasoline for use in gasoline-powered LDVs.

The SAFE Rule offers an appropriate vehicle for EPA to acknowledge that its regulatory approach to concentrations of ethanol in gasoline was superseded when E10 became the nation's certification rule on January 1, 2017. Now that E10 is the nation's certification fuel, ethanol is an EPA-approved test fuel, and therefore it satisfies the "substantially similar" requirement. If EPA wishes to regulate ethanol concentration in gasoline, it must do so under Section 211(c), which imposes the burden of proof upon EPA, rather than the ethanol industry.

E30 Would Complement and Improve Vehicle Hybridization

Transitioning to an electrified transportation fuels sector will take decades, some experts believe generations. Fortunately, opening the door to cleaner burning, higher performance, cost-competitive mid-level ethanol blends like E30 would complement the transition to hybrid electric vehicles and help meet EPA's petroleum efficiency and GHG objectives. For example, a hybrid or optimized high-octane vehicle that gets 35 miles per gallon on a 20 gallon tank fuel of gasoline (E10) would get 31% more "miles per gallon of gasoline" running on E30 – with less carbon. E30 specifically addresses three of the nation's most important priorities – reduce crude oil demand and gasoline consumption, reduce gasoline's toxic emissions, and reduce the transportation sector's carbon footprint.

Oak Ridge and other experts have emphasized the compatibility of higher compression E30 with electric vehicle technologies as they gradually come to market.

> *"Thus, if engine efficiency can be increased through compression ratio enabled by fuel AKI increase, hybrid powertrains can leverage and compound engine efficiency increases to even further improve fuel economy. This ability illustrates that hybrid powertrains are complementary to high efficiency or advanced combustion concepts.*[63]*"*

Petroleum Refiners Could Benefit from a Nationwide 100 RHOS E30 Program

Most people would agree that transitioning to a nationwide 100 RHOS with E30 would benefit consumers, automakers, farmers, and the environment/public health. However, petroleum refiners contend such a policy would damage their financial interests. In fact, a number of reputable third party studies have found that petroleum refiners could also benefit from this transition by taking advantage of lower oil costs (most U.S. refiners do not own oil reserves), minimal capital expenditures, very low operating costs, reduced carbon emissions at the refinery gate, and substantial increases in diesel and jet fuel export revenues. The nation as a whole would greatly benefit from an

[63] Id., p. 16.

improved trade balance and stronger national security because today the U.S. refining sector is now the world's largest exporter of gasoline and diesel refined products—more than 3 million barrels per day.

The study by MathPro, Ford, GM, and Chrysler[64] confirmed thatE30's superior octane properties would allow refineries to turn down or idle their energy intensive reformers, which would reduce refinery CO_2 emissions by 10%, and crude oil use by 8%. Splash blending an additional 20% of ethanol on top of E10 (to produce E30 100+ RON) would displace another 20%, for a total crude oil/gasoline displacement effect of 38%. LP models confirm that substituting ethanol for aromatics would substantially increase the output of all refined petroleum products—diesel, jet fuel, etc.—not just gasoline. Thus, consumers would save billions of dollars at the pump, and crude oil demand would be substantially reduced, e.g., an additional 30–40%. Airlines and petrochemical users would benefit from improved aromatics' supply/demand balance, which would again save consumers money, help improve chemical industry profitability and enhance manufacturers' export competitiveness.

In his declaration to the Urban Air Initiative Tier 3 petition,[65] Iowa State professor Bruce Babcock relied upon Table 2 in the Mathpro study. Mathpro's linear program model concluded that producing a 98 RON gasoline with E10 would require 28.6% aromatics, while 98 RON with E30 would reduce aromatics content to only 11.8%. This 60% reduction in aromatics would make possible an even larger reduction in tailpipe air toxics and SOA emissions from both direct injection and port fuel injection vehicles.

This is clearly a substantial reduction in aromatics, but Mathpro suggests that it may be understated due to ethanol's synergistic octane enhancement effects:

> *"However different BOB compositions can have second-order effects yielding higher RON than predicted by this approach. Combining the synergistic ethanol blending effects reported by Anderson [Ford Motor] et al. with the BOB RON values in Figure 2 yields higher finished gasoline RON values for all fuels in the study, with larger effects for E20 and E30 fuels than for E10. A key implication is that higher-octane blends would be more attractive than shown here, because they would require lower-RON BOBs."* That could translate into lower aromatics content than the 11.8% in the table.

This important study—conducted by a reputable consulting firm frequently used by the EPA, and experts from three auto manufacturers—shows how realistic it would be for EPA to achieve substantial and cost effective reductions in air toxics by encouraging the substitution of ethanol for aromatics in 100 RON high octane fuels.

As refiners become more reliant on U.S. light tight oil (LTO), their "octane appetite" grows. As refiners' use of LTO increases, automakers ramp up production of turbocharged vehicles that require higher octane gasoline, and fuel efficiency/carbon standards call for higher octane low carbon gasoline, many experts say that ethanol's octane contributions will be critically important. Unfortunately, to protect their market share, that is one reason we believe oil interests are urging EPA to finalize the REGS Rule, which would cap ethanol use at 15%--they want to block ethanol from competing fairly in the market.[66]

Why Would EPA Patent E30 Fuels "Under the Radar"?

Even while it dismissed the importance of higher octane fuels, EPA's draft TAR cited "extensive state-of-the-art research projects by experts at the EPA National Vehicle and Fuel Emissions Laboratory (NVFEL)." Ironically, NVFEL scientists used taxpayer dollars to patent higher octane mid-level ethanol blends, and finally succeeded in

[64] Supra #5, Hirshfeld et al.

[65] Supra, footnote #21.

[66] Comments of the National Farmers Union et al., as well as those of the Urban Air Initiative, et al., on the EPA's *Renewable Enhancement and Growth Support (REGS) Rule*, 81 Fed. Reg. 80828 (Nov. 16, 2016) Docket ID No. EPA-HQ-OAR-2016-0041 (February 16, 2017).

2016.[67] For whatever set of reasons, the draft TAR made no mention of this research. We think the agencies should acknowledge the work NVFEL has done in this area in the final SAFE Rule. NVFEL's effort to patent E30 reveals OTAQ's "disguised" appreciation for the value of midlevel ethanol blends. NVFEL's patent application validated the importance of E30 as a high performing, clean burning fuel to the nation:

> *"However, the preferred fuels in terms of an overall business case may be E30... This is because, an engine of the present invention adapted to combust E30… shows a 10-12% increase in efficiency over a comparable gasoline engine…As a result, the fuel would meet or outperform gasoline on a per gallon performance basis and would be acceptable for consumers…while also, on a global policy level, significantly reducing the global demand for conventional gasoline."*

Conclusion

The SAFE Rule offers EPA and NHTSA a unique opportunity to dismantle and replace the ill-advised, some believe illegal, regulatory barriers that prevent an orderly and practical transition to a 100 RHOS and prevent E30 from competing for its rightful share of the U.S. octane market. If EPA properly discharged its legal obligations under Title II of the CAAA, it could also advance a number of important national priorities that include: reducing carbon and the most dangerous toxic emissions from gasoline; meet or exceed targets set under the RFS; reduce compliance costs to automakers and consumers; stimulate rural economies; protect the public health and welfare, especially in urban areas; and significantly improve the nation's trade balance.

EPA asked for comments on actions that would be "consistent with Title II of the Clean Air Act." In 1990, Congress directed the EPA in mandatory language, saying that it "shall" reduce gasoline aromatic/BTEX compounds, and the harmful MSATs they cause, "to the greatest achievable extent…as technologies presented themselves." The Senate and House debates clearly show that the Congress knew public health threats would persist if gasoline aromatics/BTEX levels were not reduced. Therefore, Congress expected EPA/OTAQ to regulate gasoline composition as an "ongoing process." This made Section 202(l) in Title II a continuing obligation.

Importantly, Congress reaffirmed its commitment to Section 202(l) when it rejected the oil industry's efforts to eliminate it in the 2005 Energy Policy Act law, when the first RFS was enacted.

In his recent correspondence to South Dakota Farmers Union President Doug Sombke, OTAQ Director Chris Grundler admitted that OTAQ has an ongoing obligation to reduce MSATs, and the aromatics that cause them, as well as secondary organic aerosols and other harmful pollutants, see correspondence in Appendix G.

A quarter century after the passage of the CAAA, EPA, automakers, refiners, and fuel providers—including ethanol producers—face new challenges that should be transformed into opportunities. The SAFE Rule offers the U.S. transportation fuels sector an ideal and timely regulatory vehicle to move beyond today's antiquated 91 RON/87 AKI octane ratings to more a more efficient 98-100 RON/94 AKI E30 high octane low carbon clean octane standard needed to power the higher compression, more efficient, and cleaner burning engines of the future.

Refinery experts confirm that the only octane boosting compounds that can come anywhere close to making 100 RON gasoline are the heavy reformates (i.e., aromatics) and ethanol. Compared to the other commercially available octane boosting compounds, ethanol has superior octane and lower-carbon, cleaner-burning, and lower cost properties. Ethanol's 130 RON far surpasses all the others. Many experts believe that 98-100 RON would require the use of ethanol: technically, commercially, and legally.[68] (See Appendix I)

---

[67] Higher Efficiency Alcohol Fuel Engine Patent Application Number 200080230041, at http://www.faqs.org/patents/app/20080230041

[68] IHS Markit, Octane and Refining, 2017 EIA Energy Conference, June 26-27, 2017, slide 9.

Ethanol is the only octane enhancer that can transform 84 sub-octane BOBs into high quality 100+ RON finished gasoline. E30 splash-blended on top of 84 octane gasoline blendstock yields a 100+ RON, high quality, low carbon, clean-burning, cost effective fuel suitable for the advanced engines that automakers need to comply with tighter standards over the lifetime of this rule. E30 is also lower volatility, has ultra-low sulfur levels, good cooling effects, high sensitivity, low particulate matter index (PMI), contains no SOAs, and boasts other properties that General Motors experts have identified as the "preferred fuel of the future".[69]

It was also the intent of Congressional to use the CAAA to force technology improvements and advancements in fuels. The cost of cleaning up the nation's air should not be imposed exclusively on automakers, nor should they be thrust upon consumers/taxpayers when purchasing the vehicle and at refueling.

Many in the oil/refining industry and other naysayers warned that the nation could never successfully and cost effectively transition from leaded to unleaded gasoline and vehicles, and they were wrong. The same naysayers testified before Congress, mostly based on their belief of the resulting higher cost to the consumer, that the U.S. could never comply with the 1990 CAAA oxygenate fuels standard, the reformulated gasoline program, and the RFS -- and once again they were wrong. Innovation, technology, our farmers' amazing productivity, an evolving ethanol industry, and visionary national policies have enable clean-burning ethanol to prove its many multifaceted societal benefits. Ethanol is now readily available to compete in the marketplace against toxic, more expensive, and carbon-intensive oil-based octane enhancers, once EPA's illegal regulatory barriers are removed.

We believe that EPA is obligated under Title II of the CAAA to use the SAFE Rule as a regulatory vehicle to encourage a timely transition to 100 RHOS using E30. Appendix A outlines a Regulatory Reform Roadmap that would exploit this once-in-a-lifetime opportunity to realize a multitude of critically important national objectives.

Preserving the status quo would only satisfy the special interest needs of a handful of oil industry stakeholders, while inflicting great harm on the national interest.

[69] Arun Solomon, General Motors Research & Development, Engine Efficiency and Gasoline Fuel Properties, Presentation to the ASTM Task Force on High Octane Fuel Specification, April 7, 2016, slide 6.

Appendix A

A Regulatory Reform Roadmap to Help EPA Achieve SAFE Rule Objectives, Meet CAAA Requirements, and Protect Public Health While Stimulating R&D, Job Creation, Trade, and Tax Relief

We believe EPA/OTAQ has mission jurisdiction, existing regulatory authority provided by Congress, and civic responsibility to take action on comprehensive strategic plan that would address each item listed below. EPA's actions will stimulate and protect free market competition, remove unnecessary regulatory barriers that restrict market access, and restore confidence and integrity to the oversight of programs designed to protect public health and the nation's economy.

(What/Why/Outcome/Program Synergy)

1. **Establish a Timely Transition Plan to Reach a Minimum High Octane Standard of 100 RON (100 RHOS):** EPA can take advantage of the new SAFE rulemaking by implementing a comprehensive action plan (e.g., this list) that would lead to an orderly transition to a nationwide minimum 100 RHOS. **Outcome*:*** The transition to a higher octane, lower carbon, cleaner burning, lower cost fuel (e.g., E30) would be similar, yet faster and more environmentally impactful, than the nation's transition from leaded to unleaded gasoline or reformulated gasoline. **Program Synergy:** This action directly supports action item #10 and 11, and will help justify all other action items.

2. **Correct the Agency's Misinterpretation of 211(f) Substantially Similar Rule:** As of January 1, 2017 E10 became the nation's certification fuel. When that happened ethanol became an additive used in certification, therefore it should not be controlled under section 211(f). In addition, in light of EPA not finalizing the REGS Rule, its sub-sim position on ethanol has not been codified. **Outcome:** If EPA wishes to control the use of higher blends in standard (non-FFV) vehicles, the legal burden of proof is on EPA to prove higher than 15% ethanol blends damage emissions control systems, or exacerbate tailpipe emissions. This will reduce unnecessary regulations, time to market, and reduce MSATs. **Program Synergy:** This action will directly support action items #1, 2, 3, 4, 5, 6, and 11.

3. **Amend/Modify the Agency's REGS Rule:** As of this writing (10/19/2018) it appears EPA has decided not to take action on the REGS rule. It is critical that EPA issues a new interpretive rule, acknowledging that it no longer has the authority to regulate higher concentrations of ethanol in standard vehicles under Section 211(f) "substantially similar." We believe EPA lost its statutory authority to regulate higher than 15% ethanol blends on January 1, 2017, the day E10 became the nation's certification fuel, and ethanol became a "fuel additive used in certification of motor vehicles." EPA must strike the provision that will prohibit of the use of higher than 15% blends of ethanol in standard vehicle. Alternatively, EPA should strike that provision from REGS Rule from the Unified Agenda, and refuse to finalize it. **Outcome:** With the rule in place as proposed, the nation will not be able to meet the policy objectives of the renewable fuel standard or higher octane requirements automakers need to justify and cost effectively meet new CAFE/GHG requirements, which would result in lower MSATS, improve auto efficiency and reduce CO_2. **Program Synergy:** This action will directly support action items #1, 2, 5, 9, 10, and 11.

4. **Extend the 1 psi RVP Waiver for E10 to E15 and all Higher Blends:** EPA's longstanding misinterpretation of the Reid Vapor Pressure (RVP) prevents a timely transition to higher octane fuels. **Outcome:** Adding increased volumes of ethanol would benefit emissions in several aspects, including lowering volatility since vapor pressure decreases after the peak of just under 10%. Furthermore, increased ethanol volumes lower MSTATs and help meet the requirements of CAAA Section 202(l) requirements. **Program Synergy:** This action will directly support action items #1, 5, 6, 7, 9, 10, and 11.

5. **Approve a Mid-Level Ethanol Blend Certification Fuel:** EPA should expeditiously approve the use of a mid-level ethanol certification fuel to provide automakers with a necessary pathway to design optimized, higher compression vehicles optimized to use 98–100 RON gasoline. **Outcome:** E30 certification will help automakers cost effectively meet CAFE/GHG requirements by improving engine efficiency, reducing CO_2 and reducing MSATs. **Program Synergy:** This action will directly support action items #1, 2, 3, 6, 7, 8, 9, 10, and 11.

6. **Update and Reform the Agency's MOVES2014 Model:** EPA should suspend the use of its defective and outdated MOVES2014 model because the model is built upon manipulated fuel samples provided by oil interests. Samples provided for the model contained the deliberate addition of "high boiler" aromatics "to match blend" and designed to produce negative results for ethanol blends. The results unfairly and inaccurately attribute higher emissions to ethanol rather than added aromatics. The MOVES model research has been proven to be contrary to what happens in real-world retail gasoline/ethanol blending which is "splash blending." **Outcome:** States currently using the MOVES2014 Model for State Implementation Plan (SIP) compliance will no longer be deterred from using higher blends of ethanol to reduce MSATs and meet ozone attainment goals that block urban industrial development and job creation. **Program Synergy:** This action is critical to support action items #1, 7, 8, and 9, while supporting the justification for all other items.

7. **Update the Agency's 2007 Mobile Source Air Toxics (MSAT) Cost-Benefit Analysis (CBA):** EPA's obsolete and fallacious factual predicates used in its 2007 MSAT rule (e.g., $19/barrel crude oil, $.85 gasoline, and a 2:1 ethanol's octane replacement value for toluene/BTEX/aromatics) are incorrect and obsolete because it inaccurately creates the assumption that replacing toxic aromatic hydrocarbons with higher octane lower cost ethanol would not be cost effective. **Outcome:** An updated CBA will show ethanol provides positive MSAT reduction at a lower cost. Furthermore, if EPA fulfilled its mandatory obligation under Section 202(l) of the CAAA, and controlled aromatic/BTEX content in order to reduce MSAT emissions "to the greatest achievable extent," its MOVES2014 model would by definition become unusable – therefore fixed. This action is critical to support action items #1, 7, 8, and 9, while supporting the justification for all other items. **Program Synergy:** This action is critical to support the justification for <u>all</u> action items.

8. **Update The Agency's Corn Ethanol Life Cycle Analysis (LCA):** Updating EPA's woefully outdated 2010 life cycle assessment of ethanol's carbon emissions would align their data with the more recent and widely accepted Argonne National Laboratory GREET model. Among other changes, EPA's LCA model should recognize the ability of high-yield corn to restore soil organic matter, which transforms corn acres into substantial carbon sinks, and therefore adjust its carbon intensity (CI) factors for corn ethanol downward. **Outcome:** This adjustment would reduce the market access restriction of ethanol that is needed in states and countries that do or will adopt high octane low carbon fuel standards. This will support EPA's responsibility to successfully implement the RFS, and to help automakers meet the requirements of the efficiency improvement and CO_2 reduction requirements of the proposed CAFE/GHG rule. **Program Synergy:** This action is critical to support the justification for <u>all</u> action items.

9. **Comply with the Mandatory Toxic Reduction Provisions in Section 202(l) of the CAAA:** If EPA complies with the Congressional intent of Section 202(l) in the CAAA (i.e., EPA "shall" reduce MSATs to the "greatest achievable extent" it will send a clear investment signal to the transportation fuel sector. **Outcome:** Similar to the transition from leaded to unleaded and then RFG, Congressional intent was clear -- the CAAA was designed to spur innovation and force the development and advancement of both fuels and automotive technologies. Unless Section 202(l) is properly enforced, refiners will backslide and increase the aromatic content in gasoline in RFG areas and/or be dump gasoline with higher priced and higher volumes of aromatic-laced gasoline into non-RFG areas. **Program Synergy:** This action is critical to support the justification for <u>all</u> action items.

10. **Reinstate Credits for Automakers Producing Engines Optimized for High Octane (EOHO) like 100 RHOS using E30:** EPA could provide the regulatory roadmap and supporting data to help stakeholders interested in establishing meaningful CAFE/GHG credits, financial incentives to cover the cost of certification, or other ideas that would incentivize automakers to produce engines that utilize high octane low carbon fuels (e.g. E30). The EOHO precedence and example is provided by the original Flex Fuel Vehicle (FFV) credit program designed to accelerate the production of FFVs and E85 refueling infrastructure. There are now 3,291 refueling stations and over 20 million FFVs on the road. Although the program was very effective, it was essentially eliminated, even though these dual fuel vehicles were produced at no cost to the government, consumer, or taxpayer. **Outcome**: This action will send a clear investment signal to automakers that have expressed interest in being able to use a similar type credit on a pro-rated basis depending on the volume of ethanol actually used in the market. These credits will help offset the cost and investment need for retooling and emission testing needed to meet CAFE/GHG requirements. **Program Synergy:** This action supports the objectives of the RFS. EOHO credits would also leverage the U.S. Department of Energy's E85 refueling infrastructure investment by increasing the renewable/alternative fuel throughput to meet the objectives of that program by using more cost effective E30. This action directly supports <u>all</u> action items.

Appendix B

Justifications for EPA to Amend/Modify/Eliminate REGS Rule From its Unified Agenda

(Letter from the National Farmers Union and South Dakota Farmers Union
to former EPA Administrator Scott Pruitt)

June 11, 2018

The Honorable Scott Pruitt
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Subject: Renewables Enhancement and Growth Support Proposed Rule

Dear Administrator Pruitt:

In November 2016, EPA proposed the Renewables Enhancement and Growth Support (REGS) rule. According to the recently issued Unified Agenda, EPA estimates finalizing the REGS rule in November 2018, although your press office recently informed us that EPA does not have a timeline for next steps. If the REGS rule were finalized as proposed, it would codify a ban on E16+ fuel blends in non-flexible fuel vehicles (FFVs). This would unduly restrict use of ethanol's "clean octane" in the U.S. gasoline market, inflicting severe damage on the nation's family farmers, and the public health and welfare. Consequently, we strongly urge you not to finalize this provision in the REGS proposal, and to correct EPA's misinterpretation of the Clean Air Act's "substantially similar" ("sub-sim") provision in section 211(f) regarding higher blends of ethanol.

Last year, the National Farmers Union and a number of its state chapters (Minnesota, Montana, North Dakota, South Dakota, and Wisconsin) submitted the attached comments on the REGS proposed rule which reinforced those of the Urban Air Initiative et al. As explained in these comments, Section 211(f), and EPA's interpretation of the "sub-sim" provision is no longer applicable to limit use of higher blends of ethanol. This is because, since January 2017, when E10 became the nation's certification fuel ("cert fuel"), ethanol is a fuel additive used in certifications. Thus, ethanol blending in the market is no longer controlled by the sub-sim law.

If EPA chooses to regulate ethanol content—i.e., such as prohibiting the use of E30 in legacy (non-FFV) vehicles—it must do so under Section 211(c), which puts the burden of proof on EPA, not the fuel ethanol industry. A vast amount of Department of Energy and national lab (e.g., Oak Ridge, NREL, etc.) studies, as well as real world experience, conclusively proves that the use of high octane mid-level ethanol blends (E25 – E40) in legacy vehicles does NOT impair the performance of emission control systems, nor does it exacerbate harmful emissions. In fact, because mid-level ethanol blends like E30 reduce the level of carcinogenic aromatic compounds (BTEX) in gasoline, and promote more efficient combustion, the opposite is true.

The NFU et al. REGS rule comments document the best available science surrounding the use higher level ethanol blends in legacy vehicles. They also underline EPA's failure to enforce the mandatory Congressional directives in Section 202(l), first enacted in the 1990 Clean Air Act Amendments, and then reaffirmed in EPACT 2005 (which established the first RFS). The most cost effective and environmentally

Appendix B – Page 2: REGS Rule Letter from the National Farmers Union and South Dakota Farmers Union to former EPA Administrator Scott Pruitt)

safe way for EPA to comply with Section 202(l) is to encourage the widespread use of EXX/E30 blends in 98 – 100 RON higher octane gasoline. This is consistent with automakers' requests to support higher octane fuels. Unfortunately, the REGS proposed rule would do the exact opposite—it would prevent their use.

We were encouraged by your recent statements about the importance of considering higher octane gasoline when evaluating changes to the Obama fuel efficiency rule. Higher octane, lower carbon (HOLC) fuels made with mid-level ethanol blends will provide enormous societal benefits, and represent a win-win-win for automakers, consumers, the environment, and farmers. However, finalization of the prohibition of these fuels as proposed in the REGS rule would deprive the nation of such benefits.

For that reason, we respectfully request that you remove the above-referenced provision limiting the use of mid-level ethanol blends from any final REGS rule and issue a new interpretation, clarifying that the Clean Air Act's "substantially similar" provisions for gasoline no longer require a cap on ethanol.

Sincerely,

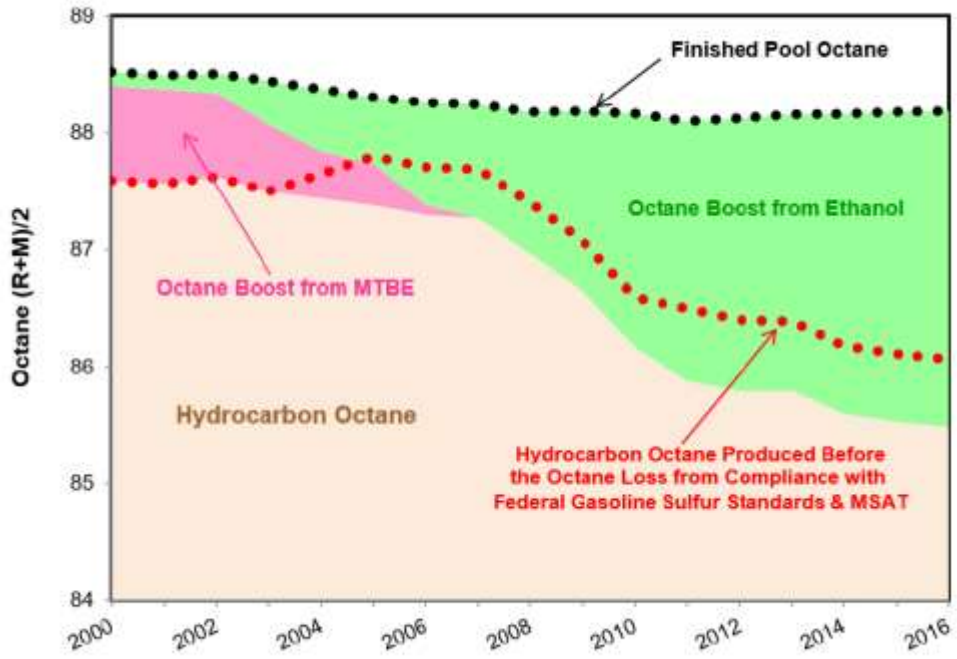
Roger Johnson
President, National Farmers Union

Doug Sombke
President, South Dakota Farmers Union

Appendix C

Net Midstream Impact on Refinery Gasoline Octane Requirement

(Ethanol Supports SAFE CAFE/GHG Rule and Refiners –
Unless Refiners Violate CAAA Section 202(l) by Increasing Aromatics)



Refinery Gasoline
Components and Options for Octane Supply

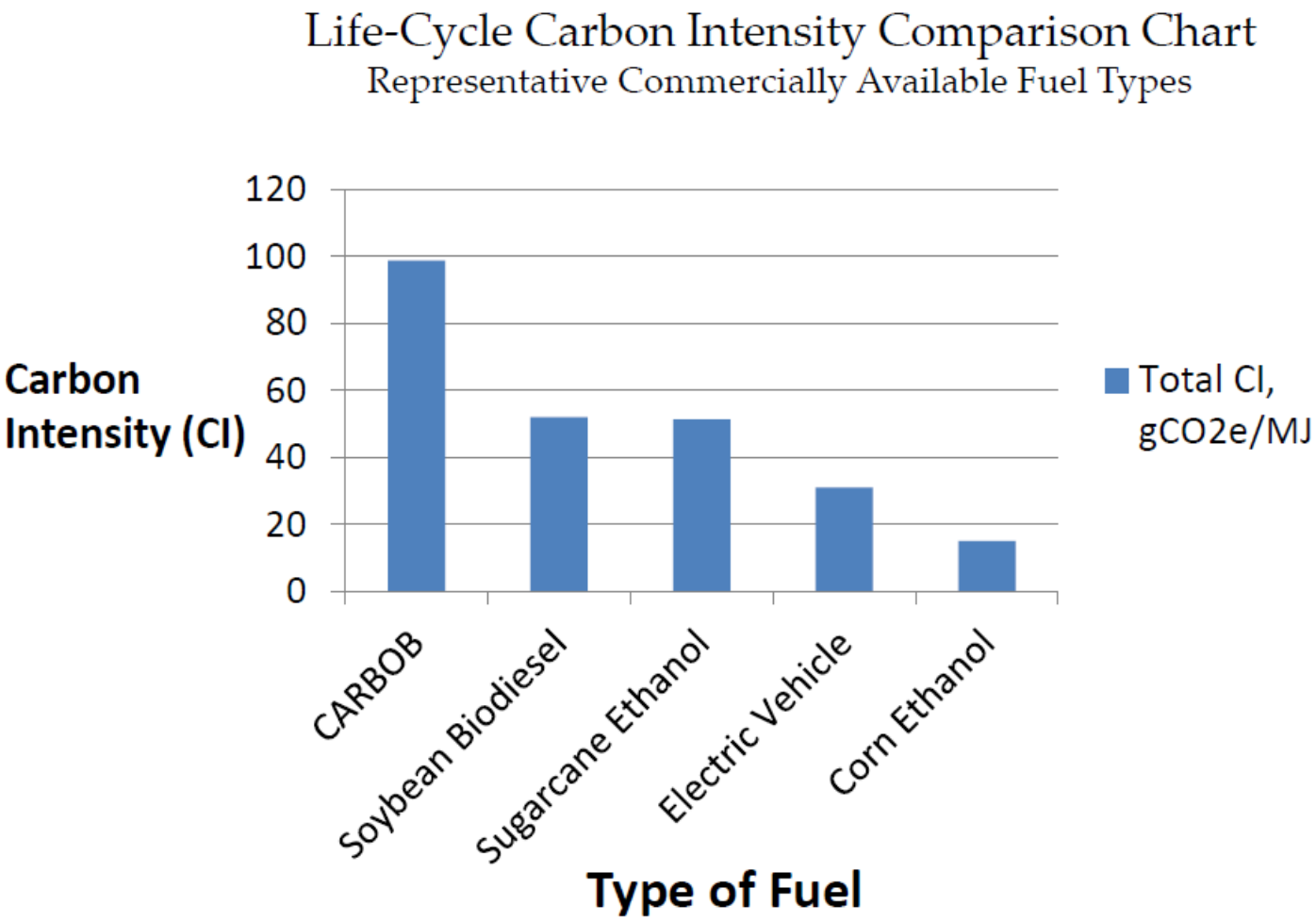
(Ethanol the Only Refinery Octane Enhancing Option Restricted by EPA Regulations)

COMPONENT	% OF POOL	VOLUME DETERMINANT	OCTANE OPTIONS
Butane	4%	Limited by volatility	Fixed
Isomerate	5%	Capacity limited	Largely fixed
Alkylate	12%	Capacity/ feed/economics limited	Largely fixed - optimize?
Reformate	22%	Swing - feed/gasoline volume	Variable - Swing producer
FCC Gasoline	30%	Refinery econmics/objectives	Largely fixed - catalyst options?
Ethanol	10%	Regulatory	Fixed
Naphtha/Other	17%	Swing -supply/gasoline volume	Largely fixed

Source: THiggins Energy Consulting, OPIS Octane Value Forum, October 2017

Appendix D

Using Today's Technology Ethanol is already lowering the C02 Levels of Gasoline Making EPA's Lifecycle Analysis Outdated and Inaccurate



Source: CFDC estimates based on capturing the Value of Carbon Intensity Reductions in Low Carbon Fuel Markets at Ethanol Plants and Corn Farms, Ron Alverson, Emerging Issues Forum, NEB, (2016), slide 27. California Air Resources Board, LCFS Illustrative Fuel Pathway Carbon Intensity, Assessment of Critical Barriers and Opportunities to Accelerate Biofuels and Biomethane as Transportation Fuels in California, UC Davis, September 17, 2015.

Appendix E

Higher Ethanol Blends Do Not Increase Formaldehyde Emissions

The EPAct Study Erroneously Reports that Ethanol Increases Formaldehyde Emissions

The best available evidence does not support the EPAct study's prediction that low and mid-level ethanol blends increase formaldehyde emissions.250

Prior studies conducted in the 1990s found that increasing gasoline's ethanol content has no significant effect on formaldehyde emissions.251 Even the CRC E-67 study, which EPA used to develop the EPAct study's fuel matrix,252 found that "neither ethanol nor the interaction between T50 and ethanol was marginally significant" for formaldehyde emissions.253 More recent studies have confirmed that mid-level ethanol blends do not increase formaldehyde emissions in modern vehicles.254 The EPAct study predicts the opposite effect, contradicting the best available science.

The EPAct study's prediction that ethanol increases formaldehyde emissions is particularly inaccurate as applied to GDI vehicles. Two studies by Oak Ridge National Laboratory have found that in GDI engines, mid-level ethanol blends reduce formaldehyde emissions.255

246 Anderson et al., supra note 7, at 1031; see also Hubbard et al., supra note 241, at 863–64 (finding THC, NMHC, and NMOG decrease significantly from E0 to E30 in PFI engine). 247 See Hubbard et al., supra note 241, at 863 & fig. 3 ("The emission of THC and NMOG exhibit a clear minimum around E20–E40, 25–35% lower than for E0 and E80."). 248 EPAct Final Report, supra note 2, at 5–6. 249 Id. at 232. 250 See EPAct Final Report, supra 2, at 10–11 (showing that increasing ethanol increases bag 1 and bag 2 formaldehyde emissions). 251 See Georgios Karavalakis et al., Impacts of Ethanol Fuel Level on Emissions of Regulated and Unregulated Pollutants from a Fleet of Gasoline Light-Duty Vehicles, 93 Fuel 549, 554 (2012) (citing several studies from the 1990s and concluding that "previous studies . . . have shown no or inconsistent changes with formaldehyde emissions as function of ethanol content").

Tier 3 Comments excerpt at p. 56:

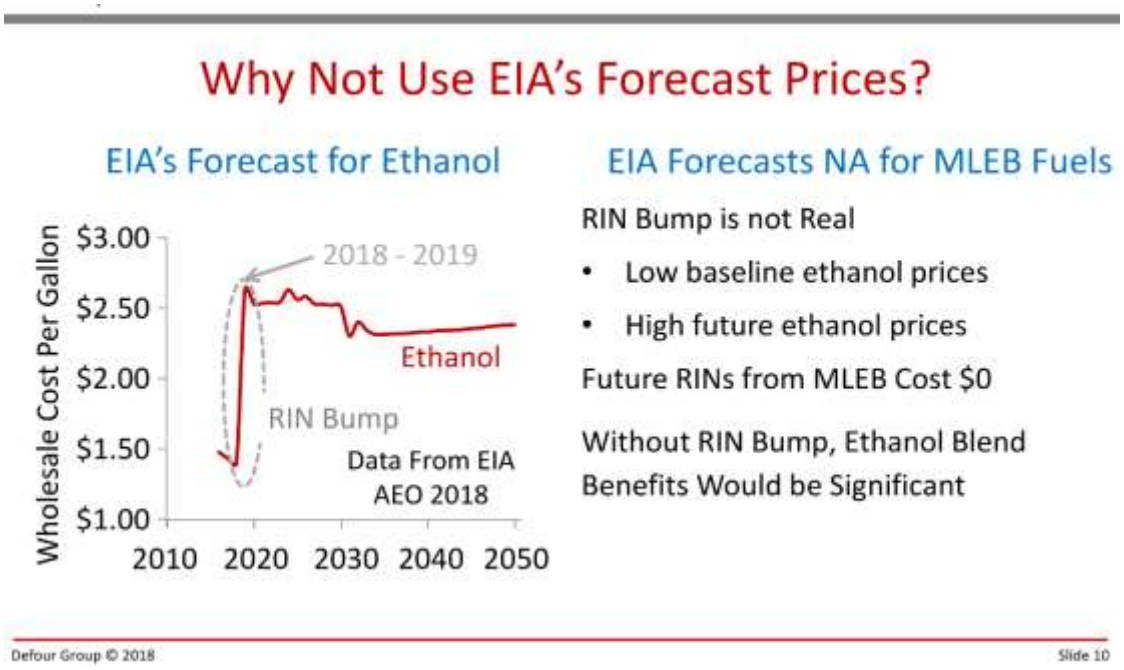
"Finally, EPA's 2007 MSAT Rule argued that adding ethanol to fuel would increase other MSATs, principally acetaldehyde.203 The available scientific literature makes clear that the reductions of air toxics that would result from moving to a mid-level ethanol blend would vastly outweigh any incidental and minimal increased emissions of acetaldehyde and formaldehyde. Both acetaldehyde and formaldehyde are emitted from gasoline as well as ethanol.204 Acetaldehyde has been classified as "possibly carcinogenic" to humans, but it is ubiquitous in nature and forms naturally in fruit, coffee and bread. It can be produced in the human body, where it is broken down into harmless acetic acid. Acetaldehyde comes last on the Department of Energy's list of air toxics,205 and EPA assigned acetaldehyde an Inhalation Risk Factor of 0.8—quite low compared (for example) to 1,3 butadiene's 100.0 Inhalation Risk Factor.206 Moreover, new engine technologies, including direct injection, will help to reduce acetaldehyde emissions. Formaldehyde is also classified as "possibly carcinogenic," although—like acetaldehyde—it is less toxic than other relevant pollutants.207 Notably, a study by Argonne National Laboratory found that ethanol blends do not significantly increase formaldehyde emissions.208 In general, aldehyde emissions occur during the initial cold-start phase and are eliminated in an active (warm) three-way catalyst.209 No study has found that exposure to acetaldehyde and formaldehyde in the concentrations that would be produced by a mid-level ethanol blend fuel would have any measurable effect on human health.210 Yet, as detailed below, there are myriad studies showing the harmful effects of current gasoline blends, which are responsible for numerous health problems and thousands of unnecessary deaths every year. Clearly, the factual predicates that justified EPA's past decision not to regulate aromatics in 2007 no longer apply. EPA is now well positioned to regulate air toxics by approving and facilitating an increase in the ethanol content of motor vehicle fuel.

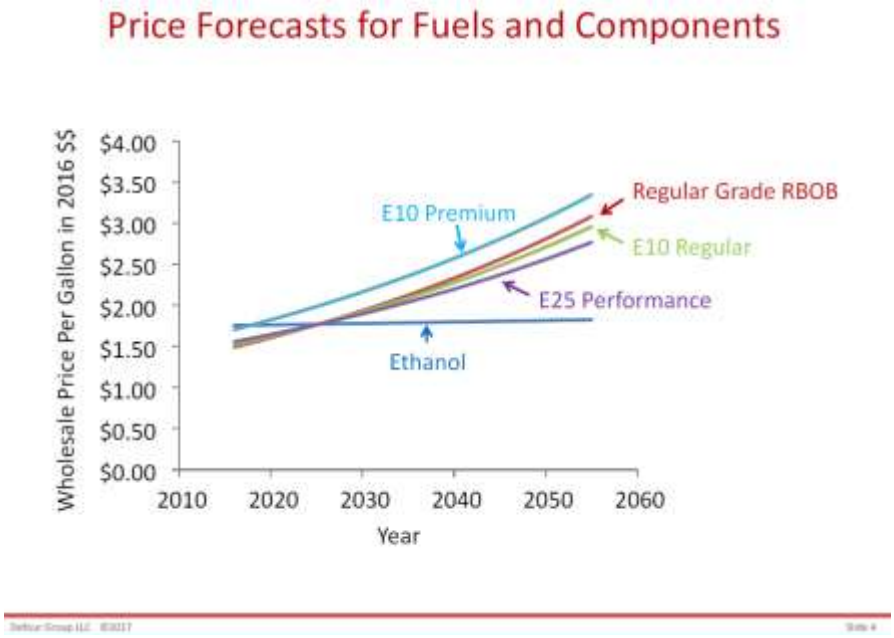
202 See RFS Waiver Denial, 77 Fed. Reg. at 70760 ("Other properties of ethanol, such as its volatility and low sulfur and benzene content, influence its value to refiners."). 203 2007 MSAT Rule, 72 Fed. Reg. at 8478. 204 Thomas Wallner, et al., Impact of Ethanol and Butanol as Oxygenates on SIDI Engine Efficiency and Emissions Using Steady-State and Transient Test Procedures 9 (Sept. 2010) (finding increased formaldehyde with iso-butanol blends, but not with ethanol blends), http://www1.eere.energy.gov/vehiclesandfuels/pdfs/deer_2010/thursday/presentations/deer10_wallner.pdf. 205 See U.S. Department of Energy, Pollutants and Health, Alternative Fuels Data Center, available at http://www.afdc.energy.gov/vehicles/emissions_pollutants.html?print; see also California EPA Air Resources Board, Stationary Source Division, California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years 13 (Mar. 22, 2012) [hereinafter "CARB Test Procedures"], available at http://www.arb.ca.gov/msprog/levprog/leviii/attacha13.pdf (assigning acetaldehyde a relative potency of 0.016 compared to 1,3-butadiene's 1.0 and benzene's 0.17). 206 See ENVIRON International Corporation, Toxicological Analysis of Ethanol-Blend Fuels 26 (July 19, 2012). 207 See CARB Test Procedures, supra note 205, at 13 (assigning formaldehyde a relative potency of 0.035 compared to 1,3-butadiene's 1.0 and benzene's 0.17). 208 See Wallner, et al., supra note 204, at 8. 209 See id. at 19."

Appendix F

Will EIA's Unrealistic RIN-Based Ethanol Price Forecast Become the New Perceived Regulatory Hurdle that Replaces EPA's Obsolete Cost-Benefits Analysis Pricing Analysis?

(Regulatory Market Functions, Tax Law, Accounting Principles, and EIA Forecasting Restrictions Distort EIA's Price Projections Comparted to Real-World Markets)





Source: DeFour Group, 2018 Fuel Ethanol Workshop

Appendix G

Correspondence Between Doug Sombke South Dakota Farmers Union and Chris Grundler, Director, EPA/OTAQ

(Letter 1 from Sombke to Grundler)

December 18, 2017

Mr. Christopher Grundler
USEPA Headquarters
William Jefferson Clinton Building
1200 Pennsylvania Ave. NW
MC6401A
Washington, DC 20460

Dear Mr. Grundler:

The December 16th Wall Street Journal carried an article entitled "Blowing Leaves, and Pollution".[1] It contained a chart—appropriately captioned "Blowing Smoke"—that compared emissions from "small nonroad spark ignition engines" (e.g., leaf blowers) to "onroad light duty vehicles" (e.g., cars and light trucks powered by gasoline). The chart noted that the information was 2014 U.S. EPA data.

Since EPA says that fine particulate matter poses the greatest health threat to Americans, I was stunned to see that EPA believes that PM2.5 (fine particulate) emissions from offroad sources (43,442 tons) were nearly the same as from LDVs ((59,301 tons). In fact, the author stated that *"Overall, EPA figures show that the small, nonroad engines contribute…1% of particulate matter, the same amount as passenger cars."*

As you must know, Mr. Grundler, that statement is absurd! The U.S. has only 12 million "leaf blowers", compared to 260 million light-duty vehicles. It is ludicrous for EPA to expect Americans to believe that 12 million "leaf blowers" emit nearly as much PM2.5 as do 260 million cars and trucks.

So I did some digging. I discovered that your group plays a very big role in all of this. It turns out that just a handful of technocrats at OTAQ are responsible for the nation's transportation fuels regulatory policy, and that you and your team have been its primary architect for 30 years or more. During that time, OTAQ has failed to update its models to include gasoline exhaust secondary organic aerosols (SOAs), which is what comprises the vast majority of urban PM2.5. (OTAQ only acknowledges primary organic aerosols from gasoline.)

It also just so happens that the predominant source of urban SOAs is the 25 – 30% fraction of gasoline known as aromatic hydrocarbons—benzene-based compound (BTEX) used by refiners to increase gasoline octane ratings.

To make matters even worse, OTAQ's attempt to hide the quantities and source of these dangerous SOAs has also covered up the fact that the SOAs bind, insulate, preserve, and

[1] Jo Craven McGinty, "Blowing Leaves, and Pollution", Wall Street Journal, December 16 – 17, 2017, A2

transport some of the most carcinogenic and mutagenic nano-particles known to man—polycyclic aromatic hydrocarbons. These are mobile source air toxics (MSATs) that Congress mandated EPA to reduce to the "greatest achievable extent" in the 1990 Clean Air Act Amendments. They are lethal in the parts per trillion, and urban Americans cannot escape them.

For more than 25 years, OTAQ has defied the will of Congress, and misled the public, media, and policymakers. You have told us that diesel fuels and vehicles, not gasoline and its BTEX carcinogens, accounted for 90+% of urban fine particulate matter.

Apparently, you do not communicate with your colleagues in the Office of Research and Development (ORD). In June of this year, ORD finally admitted what many experts have been saying for years—gasoline exhaust is the predominant source of urban SOAs. In fact, it accounts for 13 times more SOAs than does diesel exhaust.

Mr. Grundler, I think that you and your colleagues at OTAQ are the ones that are "blowing smoke". My question to you: after all these years of inaction and obfuscation, do you have any plans to "come clean", admit the truth about gasoline BTEX, and discharge your sworn duty to protect the health and welfare of the American people, especially the most vulnerable among us—our children?

Yours is a very serious responsibility. OTAQ is viewed by the media, policymakers, and the public as the "experts" on fuel composition and emissions effects. When you provide misinformation as you have here, bad policy decisions results—either by omission or commission.

I have attached my recent letter to Senator Mike Rounds, a member of the Senate Environment and Public Works Committee. The Senator considers this to be a very important issue, and my organization—and many others—plan to elevate this conversation in 2018.

I look forward to having the opportunity to visit with you about all of this soon.

Respectfully,

Doug Sombke
President, South Dakota Farmers Union

Cc: Senator Mike Rounds

Grundler Letter (1) Response to Sombke Letter (1)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL VEHICLE AND FUEL EMISSIONS LABORATORY
2565 PLYMOUTH ROAD
ANN ARBOR, MICHIGAN 48105-2498

JAN 19 2018

OFFICE OF
AIR AND RADIATION

Mr. Doug Sombke, President
South Dakota Farmers Union
1410 Dakota Avenue South
P.O. Box 1388
Huron, South Dakota 57350

Dear Mr. Sombke:

Thank you for your letter of December 19, 2017, to U.S. Environmental Protection Agency Office Director Christopher Grundler, in which you questioned EPA's emission estimates for onroad light-duty vehicles and small nonroad spark-ignition engines, which include leaf blowers and other applications. You also pointed to problems that you perceive in EPA's treatment of secondary organic aerosols (SOA) from gasoline exhaust. The Office Director has asked me to respond to you on his behalf.

EPA's National Emission Inventory (NEI), cited in the Wall Street Journal article you referenced in your letter, is the Agency's official estimate of emissions from air pollution sources in the U.S.[1] It is based on data provided by State, local, and tribal agencies as well as data developed by the EPA. Emission standards differ between onroad and nonroad engines. As noted in the Wall Street Journal article, the two-stroke engines in small spark-ignition equipment have far higher emission rates of particulates and gases relative to onroad gasoline-powered vehicles (per unit activity) causing them to have a disproportionate impact on air quality. A number of independent academic studies have also pointed to the higher emissions per unit activity or fuel use when comparing onroad and nonroad spark-ignition engines.[2,3] The EPA seeks continuous improvement of its emissions estimates and is currently working to update its estimates of the population and activity of nonroad engines and equipment.

In your letter, you state that the EPA has failed to update our models to address gasoline SOA. In fact, the EPA has continually been working on improvements to the modeling of SOA, including from gasoline exhaust. Since 2010, the EPA has incorporated new mechanisms in its Community Multiscale Air Quality (CMAQ) model to account for new information on:

- SOA yields from aromatic compounds at different NOx levels[4];
- new mechanisms for SOA from alkanes and polycyclic aromatic hydrocarbons[5];
- water solubility of SOA[6];

- SOA from plant-generated (biogenic) emissions of organic gases (e.g, isoprene, monoterpenes, sesquiterpenes)[7,8,9];
- role of semi volatile and intermediate volatility organic compounds[10,11]; and
- numerous other improvements related to meteorology and other inputs.

Furthermore, in collaboration with external groups, the EPA has applied multiple iterations of the CMAQ model to the California Research and the Nexus of Air Quality and Climate (CalNex) field campaign to improve our understanding of sources of SOA[10,11,12,13].

With respect to the contribution of gasoline and its aromatic hydrocarbons to organic aerosols and ambient fine particulate (PM2.5), independent academic summaries of the available scientific evidence indicate uncertainty about the role of gasoline vs. diesel sources and the potential impact of fuel reformulation in reducing SOA.

For example, a number of different research groups in December 2016 published an article titled, *Review of Urban Secondary Organic Aerosol Formation from Gasoline and Diesel Motor Vehicle Emissions*.[14] The article summarizes the available scientific literature this way:

- "Gasoline- and diesel-powered motor vehicles, both on/off-road, are important sources of SOA precursors. They emit complex mixtures of gas-phase organic compounds that vary in volatility and molecular structure – factors that influence their contributions to urban SOA. However, the relative importance of each vehicle type with respect to SOA formation remains unclear due to conflicting evidence from recent laboratory, field, and modeling studies. Both are likely important, with evolving contributions that vary with location and over short time scales."
- "Motor vehicle emissions are an important source for urban SOA in the developed world, but it is possible that it no longer dominates due to the dramatic reduction in emissions over the past few decades in response to strict vehicle emission standards."
- "Fuel reformulation is an option to reduce known SOA precursor components (i.e., aromatics), but existing evidence is unclear on how effective reformulation will be for SOA control..."

The Health Effects Institute also recently published an Executive Summary of its December 2016 workshop on fuel composition and PM.[15]

In your letter, you noted the recent study from EPA's Office of Research and Development.[13] The publication, based on the CalNex study, centered exclusively on Southern California around Los Angeles. While their model does show that gasoline is the single largest source of SOA explicitly identified in that area, the majority of total organic aerosol in their study came from non-mobile sources. Other sources, including cooking, biomass burning, and "other anthropogenic SOA," contributed more than 50% of the organic aerosol in urban areas, and more so in non-urban areas. The study also found that their model significantly underestimated organic aerosol concentrations at some locations (a factor of 3 in Pasadena), highlighting that considerable unknowns remain in attributing SOA to sources in CalNex. A number of other key limitations in the study make it difficult to generalize for other uses. Other publications have also argued that vehicles may not be the dominant source of organic aerosols observed in CalNex.[16]

The EPA will be continuing to systematically follow the relevant scientific literature; consult with independent organizations such as the Health Effects Institute to summarize available evidence; collaborate across our offices and with other researchers to understand and accomplish key research goals; and actively work to improve our emissions and air quality models.

Again, thank you for your letter. I appreciate the opportunity to be of service and trust the information provided is helpful.

Sincerely,

Kathryn A. Sargent for

William J. Charmley, Director
Assessment and Standards Division

---

[1] https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei

[2] Gordon, T.D.; Tkacik, D.S.; Presto, A.A.; et al. (2013) Primary gas- and particle-phase emissions and secondary organic aerosol production from gasoline and diesel off-road engines. *Environmental Science & Technology* 47(24), pp. 14137-14146. [Online at http://pubs.acs.org/doi/abs/10.1021/es403556e]

[3] Zhao, Y.; Nguyen, N.T.; Presto, A.A.; et al. (2016) Intermediate volatility organic compound emissions from on-road gasoline vehicles and small off-road gasoline engines. *Environmental Science & Technology* 50(8), pp. 4554-4563. [Online at http://pubs.acs.org/doi/full/10.1021/acs.est.5b06247]

[4] Carlton, A.G.; Bhave, P.V.; Napelenok, S.L.; et al. (2010) Model representation of secondary organic aerosol in CMAQv4.7. *Environmental Science & Technology* 44(22), pp. 8553-8560. [Online at http://pubs.acs.org/doi/10.1021/es100636q]

[5] Pye, H.O.T.; Pouliot, G.A. (2012) Modeling the role of alkanes, polycyclic aromatic hydrocarbons, and their oligomers in secondary organic aerosol formation. *Environmental Science & Technology* 46(11), pp. 6041-6047. [Online at http://pubs.acs.org/doi/abs/10.1021/es300409w]

[6] Pye, H.O.T.; Murphy, B.N.; Xu, L.; et al. (2017) On the implications of aerosol liquid water and phase separation for organic aerosol mass. *Atmospheric Chemistry and Physics* 17, pp. 343-369. [Online at https://www.atmos-chem-phys.net/17/343/2017/]

[7] Pye, H.O.T.; Pinder, R.W.; Piletic, I.R.; et al. (2013) Epoxide pathways improve model predictions of isoprene markers and reveal key role of acidity in aerosol formation. *Environmental Science & Technology* 47(9), pp. 11056-11064. [Online at http://pubs.acs.org/doi/abs/10.1021/es402106h]

[8] Pye, H.O.T.; Luecken, D.J.; Xu, L.; et al. (2015) Modeling the current and future roles of particulate organic nitrates in the Southeastern United States. *Environmental Science & Technology* 49(24), pp. 14195-14203. [Online at http://pubs.acs.org/doi/abs/10.1021/acs.est.5b03738]

[9] Pye, H.O.T.; Zuend, Fry, J.L.; et al. (2018) Coupling of organic and inorganic aerosol systems and the effect on gas-particle partitioning in the southeastern US. *Atmospheric Chemistry and Physics* 18, pp. 357-370. [Online at https://www.atmos-chem-phys.net/18/357/2018/]

[10] Murphy, B.N.; Woody, M.C.; Jimenez, J.L.; et al. (2017) Semivolatile POA and parameterized total combustion SOA in CMAQv5.2: impacts on source strength and partitioning. *Atmospheric Chemistry & Physics* 17, 11107-11133. [Online at https://www.atmos-chem-phys.net/17/11107/2017/]

Sombke Letter (2) Response to Grundler Letter (1)

South Dakota Farmers Union

1410 Dakota Avenue South PO Box 1388 Huron, SD 57350 605.352.6761 www.sdfu.org

February 5, 2018

Mr. Christopher Grundler
USEPA Headquarters
William Jefferson Clinton Building
1200 Pennsylvania Ave. NW
MC6401A
Washington, DC 20460

Dear Mr. Grundler:

Thank you for your letter of January 19, 2018, responding to my letter to you of December 19, 2017. I was a bit confused by your letter's signature block, which suggests it was authored by William J. Charmley, but signed on his behalf by Kathryn A. Sargeant. Nonetheless, I am addressing my response to you.

I appreciate your taking the time to explain why EPA's chart printed in the December 16, 2017 *Wall Street Journal* wasn't a case of "Blowing Smoke". [The article cites 2014 EPA estimates that PM2.5 (fine particulate) emissions from offroad sources (43,442 tons) are nearly as much as light-duty vehicles (59,301 tons). Relying on EPA's data, the author misled the public and policymakers by saying that: *"Overall, EPA figures show that the small, nonroad engines contribute…1 percent of particulate matter, the same amount as passenger cars."]* I expressed amazement that EPA could actually expect Americans to believe such a statement.

Unfortunately, even though your letter contained a number of footnotes, you did not answer my question. You did not explain how 12 million "leaf blowers" can emit as much PM2.5 as 260 million light-duty vehicles. It may be true that "two-stroke engines…have far higher emission rates of particulates and gases relative to on-road gasoline powered vehicles". However, this does not account for EPA's enormous under-prediction of LDV particulate matter emissions (and their associated toxics), even though by EPA's own admission such emissions pose the greatest threat to Americans' health.

Many experts warn that EPA's modeling of LDV particulate emissions is seriously flawed. EPA's failure to accurately report the extent of these harmful emissions poses a serious threat to the public health and welfare, because the causes are not being correctly identified and controlled.

Writing for the *Physicians for Social Responsibility*, Dr. Doug Brugge from Tufts University School of Medicine said: *"Most Americans are unaware that particulate pollution is the single most deadly pollution they face (and the pollutant of greatest economic consequence). Nor is there much awareness that existing regulations are inadequate…the smaller the tiny airborne particles are the more toxic they become."* [1]

In its 2007 Fine Particle rule, EPA acknowledged that its models are in need of major overhaul. The question is: ten years later, why have the problems not been corrected? We have an extensive research effort underway with regard to toxic aromatics and will release a report in the coming months. Some of the issues we are addressing, and issues raised by your letter include the following:

EPA's Reliance upon Health Effects Institute (HEI)

We are familiar with EPA's relationship with HEI. Your letter references HEI's Executive Summary of its December 2016 workshop on fuel composition and PM. We have been in contact with a number of people who attended that workshop, and have reviewed their notes of the proceeding. They report that a majority of presenters and commentators emphasized one recurring theme: EPA's models are flawed, and should be informed by real-world data. The majority of experts stated that to make proper decisions, regulators must utilize real-time measurements of real world fuels combusted under real world driving conditions, as Europe is now doing in the aftermath of the "Dieselgate" scandal.

Our literature search has revealed numerous studies that have used advanced real-time measurement techniques [e.g., aerosol mass spectrometers for SOAs, single-particle soot photometers for black carbon measurements, and gas-phase measurements of VOCs (benzene, toluene, etc.) with proton-transfer-reaction mass spectrometers]. The studies confirm that gasoline exhaust emissions far outweigh diesel exhaust emissions. The overwhelming preponderance of gasoline over diesel emissions makes sense, since the U.S. annually consumes more than 140 billion gallons of gasoline, four times greater than diesel fuel consumption. Gasoline-powered internal combustion engines power 95 percent of the vehicles on U.S. roads.

Dr. Roya Bahreini, University of Colorado – Boulder and colleagues published a 2012 study of real-time measurement of Los Angeles pollution plumes that said: *"The result indicates that the contribution from diesel emissions to SOA formation is zero within our uncertainties. Therefore, substantial reductions of SOA mass on local to global scales will be achieved by reducing gasoline vehicle emissions."* Similar results were reported for studies of urban pollution plumes in Paris, France, despite their heavier use of diesel vehicles. In 2013, Nordin et al. published a paper that compared the Bahreini work to a Gerntner study (which you cited) that questioned the Gerntner results, and concluded that: *"gasoline exhaust readily forms secondary organic aerosol with a signature aerosol mass spectrum with similarities to the oxidized organic aerosol that commonly dominates the OA mass spectrum in and downwind of urban areas. This substantiates recent claims that gasoline SOA is a dominating source to SOA in and downwind of large metropolitan areas.* [2]

However, in stark contrast to real-time measurements using sophisticated and proven techniques, your Agency's models predict that gasoline exhaust is only a minor contributor to urban PM2.5 emissions, on par with that of 12 million "leaf blowers". Consequently, EPA has failed to address the most harmful fraction of gasoline—the 25 – 30 percent which is comprised of benzene-based aromatic hydrocarbons (BTEX) added by refiners to boost gasoline octane ratings, and which Harvard School of Public Health and other experts confirm is the predominant source of urban SOA-bound toxics. This oversight is causing substantial harm to the public health and welfare.

Research by Pacific Northwest National Labs and others confirms that BTEX-generated secondary organic aerosols (SOAs) synergistically bond with highly toxic polycyclic aromatic hydrocarbons (PAHs), insulate and preserve them, and thus enable their long-range transport (LRT) for months and miles. EPA's official position is that these toxic particles, to the extent they even exist, have very short half-lives (less than an hour), and a range of only 300 feet. In fact, the vast majority of Americans are exposed to these lethal SOA-borne PAHs on a 24/7 basis, and they penetrate into homes, cars, and schools. Infants and children suffer the most from these carcinogenic, mutagenic, and endocrine-disrupting compounds.

HEI has acknowledged the distinctions between gasoline and diesel exhaust. *"Typically, gasoline UFPs [ultrafine particles] contain a higher fraction of heavy polycyclic aromatic hydrocarbons (PAHs) than diesel exhaust (DE)*

which may have implications for the differential toxicity of these particles…" [Health Effects Institute Study on Ultrafine Particulates, Feb. 2013, p. 21.]

Dr. Andre Nel, a highly regarded UCLA researcher, published a May 6, 2005 *Science* article that underscored the dangers gasoline ultrafine particles pose to human health: *"Ultrafines are the major component in vehicle emissions—the largest source of air pollution in urban areas—and they have the largest surface area and high content of potentially toxic hydrocarbons among all PM sources. They can also penetrate deeper into lung tissue than fine or coarse particles."*

In 2010, National Institute of Environmental Health Sciences (NIEHS) Director Dr. Linda Birnbaum testified before the Senate Environment and Public Works Committee about the dangers these emissions pose to children, comparing them to leaded gasoline's effects: *"In a 2009 study of the effects of PAHs on children's IQ in NYC…the mothers' exposure as measured during their pregnancies by wearing backpack monitors was associated with a decrease in IQ among the more exposed children. The extent of this effect was similar to that of low-level lead exposure."*[3]

Southern California Particle Center Researchers Have Warned EPA for Years

Experts at the Southern California Particle Center (SCPC), led by respected USC researcher Dr. Constantinos Sioutas, have urged EPA to correct its methods for many years, to no avail. They have been especially critical of EPA's exclusive focus on particle mass, as opposed to particle number. SCPC wrote:

"Advanced vehicle emission control technologies are effective in reducing solid, non-labile PM emissions by means of filtration. However, recent investigations have shown substantial increases (by one order of magnitude and often more) of particle number emissions from retrofitted vehicles…We thus recommend that a better understanding of the linkages between PM size, chemistry and toxicity should be developed in order to adopt regulatory strategies that might be sufficiently protective to the public. Of particular note is the semi-volatile PM from vehicular exhaust because of its unique role in atmospheric processes leading to the formation of secondary aerosols…Given the increased toxicity of these semi-volatile species, efforts should be made to reduce their emissions from newer vehicles, including reductions in their gas-phase precursors formed during the combustion process."

"We also recommend that current emission testing procedures should be modified to reflect real-world conditions in characterizing PM emissions and evaluating their impacts of ambient exposure." [Emphasis supplied.] [4]

Biogenic vs. Anthropogenic SOA Emissions

EPA has long contended that trees and other biogenic sources are responsible for most of urban SOA emissions; we are familiar with the studies you cited in your letter. However, the literature contains numerous peer-reviewed studies that contradict EPA's view of biogenic source contributions to urban SOA inventories. In fact, a 2010 study by EPA's own Office of Research and Development (which your letter neglected to cite) concluded that carbonaceous material from mobile sources (e.g., gasoline aromatic hydrocarbons/BTEX emissions) substantially enhances biogenic SOA formation by facilitating the transformation of naturally-emitted VOCs to the particle phase. ORD estimated that more than 50 percent of biogenic SOA could be controlled by reducing anthropogenic SOA emissions caused by mobile sources, which are predominantly caused by gasoline-powered vehicles in the U.S.

In its study, ORD acknowledged that CMAQ 4.7 has a "persistent negative bias" (which as mentioned earlier EPA also admitted in its 2007 Fine Particulate rulemaking, promising "timely corrections" that have yet to occur), which "likely arises from a combination of errors and uncertainties, such as inadequate representation of anthropogenic SOA, PCM (primary carbonaceous particulate matter) emissions that do not account for intermediate volatility species (IVOC)...". According to a 2013 Harvard study and other experts—including, interestingly enough, HEI—the predominant urban source of these emissions is gasoline BTEX.

Another 2015 study put the spotlight directly on gasoline aromatic hydrocarbons/BTEX:

"Aromatic hydrocarbons are important precursors of ground level ozone and play an important role in the formation of ozone and secondary organic aerosols (Carter, 1994; Liu et al., 2008a). Once the compounds are released into the atmosphere, most aromatic compounds are released into the air and react rapidly with OH and can participate in the formation of photochemical smog in the presence of nitrogen oxides. Hence, the abundance and speciation of aromatic hydrocarbons in the atmosphere significantly affects the ambient atmospheric chemistry (Monod et al., 2001). It has also been reported that O3 chemical production can be influenced by the concentrations of volatile organic compounds, and different species (e.g., aromatics) have different contributions to the ozone photochemical formation. Thus, identification of the emission sources of these species and their contributions to ozone formation are a crucial issue for the development of an effective O3 control strategy (Tang et al., 2007, 2008)."

CMAQ/CalNex Findings Have Been Contradicted by Numerous Studies

Your letter mentioned the CMAQ model and applications to CalNex field work which you say raised uncertainties about SOA sourcing and fuel reformulation benefits. However, a February 2009 study—which EPA funded—indicates that the science is more certain than your letter suggests. Over a multi-year period, five prestigious academic centers—Harvard School of Public Health; UCLA; USC; NY Univ. School of Medicine; and Univ. of Rochester Med Center)—warned about the "greater toxicity of traffic-related particles". They emphasized mobile sources/traffic as primary culprits, and called UFPs (ultrafine particles, which EPA has yet to regulate, and which HEI has singled out as particularly dangerous to humans) the most pathogenic, "proatherogenic fraction".

The experts warned that "…mobile sources are highly relevant to the public health impacts of PM.", and criticized EPA's regulatory philosophy that has fixated only on "mass": *"The PM NAAQS are based on mass concentration…a more sophisticated approach to standards will be needed. Based on findings from the PM Centers and others, the potential efficacy of numbers and component based standards should be assessed. As more data becomes available to link specific PM emissions sources…with quantitative measures of toxicity, the questions of source-specific control strategies to maximize public health protection also need to be considered."*

Implicit in these PM experts' recommendation is the need for improvements in gasoline composition, specifically reductions in gasoline BTEX content, as Congress directed in Section 202(l) of the 1990 Clean Air Act Amendments.

EPA's 2007 MSAT Rule Acknowledged Linkage of SOAs to Gasoline BTEX

In its 2007 MSAT final rule, EPA acknowledged that "there may be compelling reasons to consider aromatics control in the future, especially regarding reduction in secondary PM2.5 emissions, to the extent that evidence supports a role for aromatics in secondary PM2.5 formation". At the time, EPA cited "limits in the modeling tools that limit our present ability to quantitatively predict what would happen…" However, in its 2010 RFS2 Regulatory Impact Analysis (RIA), EPA acknowledged that "toluene is an important contributor to anthropogenic SOA", and that "mobile sources accounted for 70 percent of the total nationwide ambient concentration of toluene".

How the work of these reputable medical professionals, scientists, and academics has been ignored is difficult to reconcile. The linkage of these harmful particulates to gasoline is not the result of a fringe group or a discredited study but instead what is broad consensus. EPA seems to be the only ones that are "uncertain" or "confused". You should be reminded that Congress in effect made its own endangerment finding by directing EPA to address this issue ("shall") in the CAA of 1990. EPA needs to do its job, and embrace the obvious linkage between gasoline BTEX and urban SOAs. In so doing, by its own admission, the agency would be obliged to revisit Section 202(l) and its directive to reduce MSATs to the "greatest achievable extent".

Notwithstanding EPA's professed "uncertainty", Congressional intent is clear: EPA's responsibility to substantially reduce air toxics caused by gasoline aromatic hydrocarbons has not been fulfilled, and more than 25 years later, action is long overdue.

Once again, Mr. Grundler, thank you for your response. We would like to find a way to get with you and your staff and resolve some of these issues, perhaps a meeting at a neutral site with our respective experts. As I hope you recognize by now, this is a very important issue to us and we intend to remain actively engaged in it.

Respectfully,

Doug Sombke
President, South Dakota Farmers Union

Cc: Senator Mike Rounds

---

[1] http://www.psr.org/environment-and-health/environmental-health-policy-institute/responses/particulate-pollution.html
[2] http://www.atmos-chem-phys-discuss.net/12/31725/2012/acpd-12-31725-2012-print.pdf
[3] http://www.niehs.nih.gov/about/assets/docs/testimonybirnbaumfeb042010_508.pdf
[4] http://aaqr.org/VOL10_No1_February2010/6_AAQR-09-05-IR-0036_43-58.pdf

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 15 2018

Mr. Doug Sombke, President
South Dakota Farmers Union
1410 Dakota Avenue South
P.O. Box 1388
Huron South Dakota 57350

Dear Mr. Sombke:

Thank you for your letter of February 5, 2018, which continues our correspondence of December 19, 2017 and January 19, 2018. We share your interests in reducing particulate matter (PM) and polyaromatic hydrocarbons (PAHs), and in research on measurement and modeling that could help lead to effective control strategies.

With respect to your concern that the Environmental Protection Agency's (EPA's) models incorrectly predict the contribution of light-duty gasoline vehicles to PM (e.g., as compared to leaf-blowers), it is important to note that the EPA estimates cited in the *Wall Street Journal* refer only to directly emitted PM. We agree that ambient levels of PM are a result of secondarily formed particles in addition to direct PM emissions, and that light-duty gasoline vehicles are important sources of the precursors to PM formation.

With respect to Clean Air Act section 202(l), the EPA has acted twice under this specific authority, including the February 2007 rule that addresses the aromatics content of gasoline through required limits on benzene (72 FR 8428, February 26, 2007). In addition, the EPA promulgated additional "Tier 3" vehicle emission and fuel standards under sections 202(a) and 211(c), as referenced in section 202(l) (79 FR 23414, April 28, 2014). These standards took effect last year and will reduce emissions of air toxics from on-highway vehicles, as well as emissions of volatile organic compounds (VOC), nitrogen oxides (NOx), and fine particulate matter ($PM_{2.5}$).

Since Congress established section 202(l) in the Clean Air Act Amendments of 1990, the net result of the EPA regulations and market shifts has been a reduction in gasoline benzene levels by roughly two thirds and aromatics levels by roughly one third (https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100T5J6.pdf). In addition, the vehicle emissions standards have been reduced through three separate rounds of rulemaking (Tier 1, Tier 2, and Tier 3) such that the VOC emission rate of today's vehicles is more than 90% lower than in 1990. In combination, these fuel and vehicle standards have already dramatically reduced air toxics emissions. While the EPA continues to look for opportunities to further reduce air toxics, as required by Clean Air Act section 202(l), we must also consider technological feasibility and costs,

among other factors. We take our regulatory authority very seriously and must ensure the appropriateness of taking further regulatory action before doing so.

Again, thank you for your letter. I appreciate the opportunity to be of service and trust the information provided is helpful.

Sincerely,

Christopher Grundler, Director
Office of Transportation and Air Quality

Appendix H

The Benefits of Ethanol Blends are not Linear Based on Volume
E30 Helps Automakers Achieve Maximum CAFE/GHG Benefits with Current Technology

Table 2. Estimation of Efficiency, Volumetric Fuel Economy, and CO_2 Emissions for a GTDI Engine with Higher CR Enabled by Higher-Octane Fuel with Comparison to Ref 28 Engine Dynamometer and Vehicle Modeling Results[a,b]

fuel	91-RON E10 (baseline)	96-RON E20		101-RON E30	
	ref 28	ref 28	estimate	ref 28	estimate
RON	90.8	96.2		100.7	
ethanol (%v)	10.2	20.4		31.5	
energy content (MJ/L)	30.8	29.7		28.5	
energy-based carbon content (gC/MJ)	72.7	72.5		72.4	
effective RON	90.8	n/a	96.2	n/a	100.7
CR	10.0	11.9	11.8	> 13.0	13.3
efficiency gain from higher CR (% vs baseline)	baseline	n/a[c]	3.48%	n/a	5.35%
efficiency gain from higher ethanol content (% vs baseline)	baseline	n/a[c]	0.51%	n/a	1.07%
Estimates without Downsizing:					
total efficiency gain (% thermal efficiency change vs baseline)	baseline	4.7% M/H 4.8% US06	4.0%	6.0% M/H 9.6% US06	6.5%
FE change (% MPG change vs baseline)	baseline	1.0% M/H 1.1% US06	0.3%	−2.1% M/H 1.2% US06	−1.7%
tailpipe CO_2 change (% g CO_2/mi change vs baseline)	baseline	−4.8% M/H −4.9% US06	−4.1%	−6.0% M/H −9.1% US06	−6.5%
Estimates with Downsizing:					
efficiency gain multiplier from downsizing ($F_{downsize}$)	n/a	n/a[d]	1.1	n/a	1.1
efficiency gain from downsizing (% vs baseline)	baseline	n/a[d]	0.35%	n/a	0.54%
total efficiency gain (% thermal efficiency change vs baseline)	baseline	n/a[d]	4.4%	n/a	7.0%
FE change (% MPG change vs baseline)	baseline	n/a[d]	0.6%	n/a	−1.2%
tailpipe CO_2 change (% g CO_2/mi change vs baseline)	baseline	n/a[d]	−4.5%	n/a	−7.0%

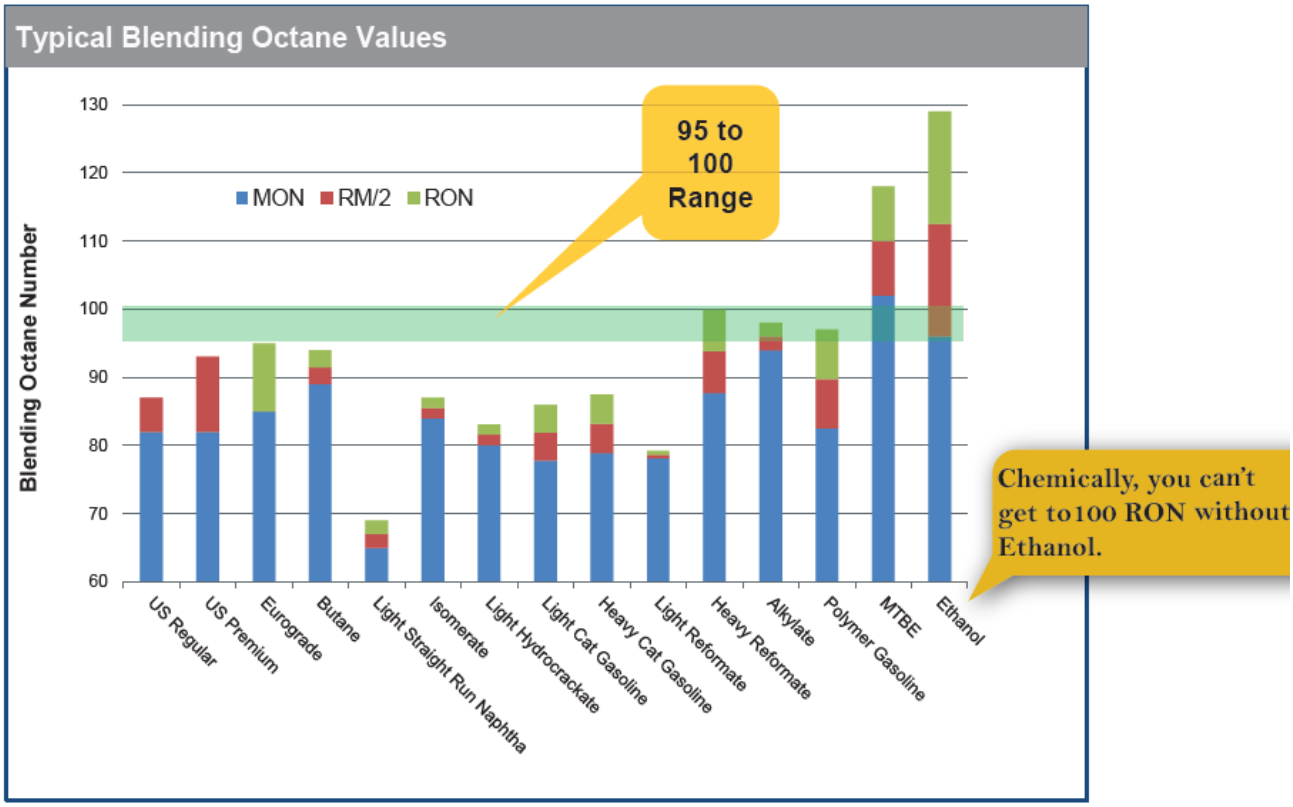
[a]All fuel property data taken directly from ref 28. [b]"M/H" indicates result for U.S. EPA metro-highway test cycle. "US06" indicates result for EPA US06 highway test cycle. [c]The total efficiency gain was measured in ref 28. A breakdown of contributing factors was not reported. [d]The calculated changes in vehicle efficiency, fuel economy, and CO2 emissions in ref 28 did not include incremental benefits from additional downsizing.

Source: Thomas G. Leone et al., The Effect of Compression Ratio, Fuel Octane Rating, and Ethanol Content on Spark-Ignition Engine Efficiency, Environ. Sci.Techn. (2015). Also see, Arun Solomon, General Motors Research & Development, Engine Efficiency and Gasoline Fuel Properties, Presentation to the ASTM Task Force on High Octane Fuel Specification, April 7, 2016, slide 6.

Appendix I

Ethanol's Octane Blending Value to Refiners Is Restricted by Current EPA Regulations Capping Blends at 15 vol %

Every component has different RON, MON, and AKI (RM/2)



Very few refinery components exceed 95 RON – limiting the capability of refiners to improve pool octane to that level