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U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Submitted via email to OptimaRFI@ee.doe.gov

RE: Response to Request for Information (RFI) DE-FOA-0001460 **Category 2**

The Renewable Fuels Association (RFA) appreciates the opportunity to provide these comments in response to the Office of Energy Efficiency & Renewable Energy's (EERE) Request for Information on Co-Optimization of Fuels and Engines ("Optima"). [RFI DE-FOA-0001460]

RFA is the leading trade association for the nation's ethanol industry. Its mission is to advance the development, production, and use of fuel ethanol by strengthening America's renewable fuels industry and raising awareness about the benefits of biofuels. Founded in 1981, RFA serves as the premier meeting ground for industry leaders and supporters. RFA's 300-plus members are working to help America become cleaner, safer, more energy secure, and economically vibrant.

As an initial matter, RFA strongly supports the Optima initiative and encourages the Department of Energy (DOE) to continue applying appropriate resources and attention to this important program. We agree that co-optimization of future fuels and engines is an essential strategy for achieving national objectives related to energy conservation, carbon emissions reduction, and energy security. The Optima program is innovative and proactive, and the DOE should be applauded for undertaking such a bold and progressive initiative.

On behalf of the nation's ethanol producers, RFA is fully committed to collaborating with DOE to ensure the continued success of the Optima program. While a significant amount of research has already been completed to demonstrate the efficacy and efficiency of High Octane Fuels (HOF) in optimized spark ignition (SI) engines, much work remains to be done to establish a clear pathway to commercial introduction of these fuels and engines. RFA stands ready to assist the Optima program in any way possible to leverage the existing body of HOF research; identify and address knowledge gaps; and overcome technical, regulatory, and marketplace barriers to the introduction of co-optimized fuels and engines.

In this comment letter, we respond to EERE's Request for Information (RFI) on **"Category 2: Input on Barriers to Market Acceptance and Deployment."** We address the RFI for Category 1 in a separate response letter. Our comments are primarily focused on "Thrust I – Improvement of near-term conventional SI engine efficiency," as we see this component of Optima as most critical to the achievement of nearer-term goals to decrease transportation-related carbon emissions and reduce petroleum consumption.

We offer the following perspective on the potential barriers to co-optimized fuels and engines identified by EERE in the RFI.

- **Public Perception and Consumer Acceptance**: While public perception is an important consideration, we do not see it as having the same level of importance as other barriers identified by EERE. Numerous surveys and polls have determined that consumer acceptance regarding energy purchases is primarily motivated by economics. A particular fuel's cost relative to other options consistently ranks as the top consideration for consumers. For example, research has demonstrated that E85 consumption by flex fuel vehicle (FFV) drivers increases in a linear—or, in some case, exponential—fashion as the cost of E85 relative to other options falls. We expect the same to be true for HOFs. If HOFs are priced competitively with other fuel options, and if consumers drive vehicles that able to operate safely and efficiently on HOFs, then we expect consumer acceptance to be strong. While additional research into consumer attitudes regarding prospective HOFs may be useful, we do not see this as a priority area for DOE resources.

- **Policy and Regulation**: We agree with EERE that policy and regulatory barriers to HOF commercialization are real and daunting. In fact, we believe certain regulatory barriers pose the most significant threat to commercial introduction of HOFs. Federal regulatory barriers that must be addressed include: fuel volatility (RVP) regulations; Tier 3 regulations regarding certification fuels; new fuel registration requirements; treatment of biofuels and FFVs in determining compliance with 2017-2025 CAFE/GHG standards (e.g., "R-factor" and "F-factor" values); inconsistent boundaries and approaches to regulatory lifecycle GHG accounting; and tailpipe pollutant (i.e., non-GHG) emissions estimation. In addition, a number of state regulatory barriers need to be addressed to facilitate introduction of HOFs. RFA is undertaking a comprehensive analysis of regulatory barriers to HOF commercialization and would welcome collaboration with DOE or other interested stakeholders.

- **Low Cost**: We agree that cost will be a primary determinant of consumer acceptance of co-optimized fuels and engines. Based on ethanol's historical cost competitiveness with gasoline and alternative octanes, we believe HOFs made with higher levels of ethanol will be highly competitive and economically beneficial to the consumer. In addition, it is our understanding that optimization of SI engines to consume HOFs is a low-cost

proposition relative to other fuel/propulsion co-optimization options. Still, we believe additional analysis should be conducted on the potential micro- and macroeconomic impacts of HOF introduction under multiple scenarios. Importantly, government policies focused on carbon emissions reduction play a role in determining retail energy costs and can lead to lower prices at the pump for consumers (i.e., through monetizing carbon; current examples include RFS RIN credits and California LCFS credits).

- **Low GHG Impacts**: RFA agrees that co-optimized fuels and engines must offer GHG savings over business-as-usual scenarios. Research by DOE's Argonne National Laboratory, Ford Motor Company, and others has already demonstrated that HOFs made with higher levels of ethanol can offer substantial GHG reductions compared to today's marketplace fuels and other potential future fuel options. Still, lifecycle GHG analysis is an evolving science and additional improvements in modeling methodologies and input data are needed to more accurately reflect the actual GHG impacts of ethanol and finished HOFs.

- **High Volume**: Extensive analysis has been conducted to determine the agriculture and ethanol industries' future capacity to supply feedstock and biofuel volumes necessary to facilitate large-scale HOF adoption. DOE entities have been involved in much of this work (e.g., Sandia National Laboratories' "90 Billion Gallon Study," the DOE/USDA "Billion Ton Study," etc.). These analyses generally agree that the U.S. agriculture and biofuel sectors have the technological capacity to sustainably expand ethanol production without adversely affecting economic welfare. The challenge, however, is that there will be no economic incentive for further expansion of ethanol production capacity unless there is some certainty that HOF-capable vehicles and refueling infrastructure will be simultaneously deployed.

- **Infrastructure Compatibility**: We agree that infrastructure compatibility may serve as a barrier to HOF introduction. However, significant work has been done to demonstrate that: 1) a large portion of existing fuel transportation, storage and dispensing infrastructure is already compatible with HOFs containing higher levels of ethanol; and 2) relatively low-cost options already exist in the marketplace for upgrading or modifying incompatible equipment. Further, testing and certification protocols already exist for new HOF-capable equipment (e.g., Underwriters Laboratory). While some additional work may be needed to determine the compatibility of existing supply chain infrastructure, the costs of mid-level ethanol HOF-capable infrastructure upgrades are relatively well known. A more important need in this area is educating midstream and downstream supply chain participants on the likely payback period (ROI) associated with HOF-capable infrastructure upgrades, as well as education on available incentive programs, the potential value proposition, etc.

The RFI also asks a series of questions related to potential barriers to co-optimization of HOFs and engines. We address several of those questions below:

1. **Are there additional barriers or nuance that should be considered?**

    - Of the potential barriers identified in the RFI, we believe existing regulatory barriers (many of which we identify in the previous section) are the most significant challenge to introduction of HOFs and co-optimized vehicles.

    - The current lack of standards and specifications for HOF is also a barrier, but it is being proactively addressed by DOE and auto and ethanol industry stakeholders.

    - An overarching barrier to the deployment of co-optimized engines and HOFs is the so-called "chicken and egg" phenomena, whereby automakers are hesitant to invest in manufacturing HOF-optimized vehicles until HOFs are substantially available in the marketplace, and in turn fuel producers are reluctant to invest in infrastructure to produce and distribute HOFs until HOF-optimized vehicles are substantially available. DOE and stakeholders should focus intensively on developing potential strategies that avert the "chicken and egg" dilemma and allow simultaneous deployment of HOF-optimized vehicles and HOF-capable infrastructure.

    - A primary objective of the Renewable Fuel Standard (RFS) was to eliminate this "chicken or egg" fuel/engine situation by specifying biofuel volumes that must be consumed annually far in advance, providing substantial lead time for affected industries to implement plans. However, the U.S. EPA's unlawful reinterpretation of its statutory waiver authority and its reduction of RFS volume obligations has raised serious concerns about the future viability of the RFS as a tool for driving the transition to HOFs and optimized SI engines.

2. **What is the value proposition to consumers that would enable a price differential?**

    - As stated in the previous section, research on consumer attitudes regarding energy purchases has demonstrated that relative cost is the primary motivator for fuel purchasing decisions. While HOFs would unquestionably benefit consumers through reduced GHG emissions, decreased emissions of other pollutants, improved engine performance, and increased energy security, history has shown that consumers are not necessarily willing to pay premium prices for these attributes. E85 is a good example of this.

    - Accordingly, we believe strategies to develop co-optimized HOFs and engines should not assume a (positive) price differential is necessary or desirable. Rather,

Optima strategies should prioritize achievement of retail cost competitiveness with incumbent marketplace fuels and vehicle technologies.

- However, to the extent that government policies compel the monetization of carbon emissions reductions (e.g., RFS RINs or CA LCFS credits), the economic benefit of these instruments can be transmitted to consumers through lower fuel prices.

3. **Is there a value proposition for fuel providers that would improve the chances of an Optima fuel being brought to market?**

    - We believe HOFs can offer distinctive value propositions to each segment of the fuel supply chain. Using ethanol as the octane source in HOFs can lower petroleum refining costs and reduce stationary source emissions from the refinery. For fuel marketers and retailers, HOFs made with higher ethanol content could offer opportunities for expanded margins, especially when carbon credit values (e.g., RINs, LCFS credits) are considered. However, it remains challenging to convince marketers and retailers of the value proposition, as they are primarily concerned with the initial upfront cost of HOF-capable infrastructure upgrades. More work is needed to present the potential "business case," value proposition, and likely ROI of HOFs to fuel marketers and retailers.

4. **What is the best strategy for transitioning new engine or fuel production technology to the marketplace?**

    - We believe elimination of certain existing regulatory barriers would do more to facilitate a transition to co-optimized HOFs and engines than almost any other action. Modernizing the regulatory processes to legally register and introduce new fuels; certify emissions compliance for new vehicles; and demonstrate compliance with fuel economy/tailpipe GHG standards would help clear the pathway to commercial introduction of HOFs and co-optimized engines.

    - Enforcement of policies that compel the monetization of carbon reductions will also play an important role in creating the value proposition for HOFs that offer lower GHG emissions relative to incumbent marketplace fuels.

    - While the likely societal benefits associated with HOFs (e.g., reduced GHG emissions, reduced tailpipe pollutants, enhanced energy security, etc.) should theoretically create demand pull and allow for premium pricing relative to incumbent fuel options, we believe that policy and regulatory interventions will remain necessary until these fuels have successfully gained market access at scale.