



Natural Gas Vehicles for America

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Mr. David Howell
Acting Director
Vehicle Technologies Office
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

RE: U.S. Department of Energy DE-FOA-0002372: Request for Information on Office of Energy Efficiency & Renewable Energy's Medium- and Heavy-Duty Truck Research and Development Activities & Super Truck Initiative

Dear Mr. Howell:

NGVAmerica respectfully offers the following comments in response to the U.S. Department of Energy (DOE) notice concerning its "medium and heavy-duty freight energy and operational efficiency R&D planning." NGVAmerica commends DOE for issuing this notice and appreciates the opportunity to comment on the research priorities and respond to the important questions raised in the DOE's notice.

NGVAmerica is the national trade organization dedicated to the development of a growing, profitable, and sustainable marketplace for vehicles and carriers powered by clean, affordable and abundant natural gas or biomethane. Our 200-plus member companies produce, distribute, and market natural gas and biomethane, manufacture and service natural gas vehicles, engines, and equipment, and operate fleets powered by clean-burning gaseous fuels across North America.

In offering the following comments, we note that we are not addressing all of the Categories or Questions raised by DOE in the notice. For some of the questions raised we do not have comments because we don't have data to support an informed response.

Comments:

Category 1: Freight Operational Efficiency and Systems

1.b.1. – 1.b.2. This section of questions deals with the metrics used for determining the efficiency of different technologies.

Comment: NGVAmerica generally supports the continued use of the ton-miles/gallon as an appropriate metric for truck efficiency but believes this metric also should account for the weight or tons of goods shipped. For example, measuring the fuel efficiency of operating an 80,000 fully loaded truck or any other fully loaded truck that operates at its maximum weight threshold also should assess the amount of cargo moved per gallon. Studies comparing natural gas to electric vehicle options often overlook that fact that to do the same work, electric transit bus or truck operators will have to operate more trucks to service the same total miles or deliver the same amount of cargo. In the case of freight trucks that operate at less-than-load or less-than-truckload this may not be as much of an issue but can still be an issue if certain technologies have more limited range capabilities, require deployment of additional vehicles, or must incur additional downtime during service for purposes of refueling or charging. These factors have huge implications for the cost effectiveness of different technologies and should be accounted for when evaluating different technologies.

DOE also requested information on total cost of operation, which we also believe is a difficult factor to determine but, nevertheless, an important one to evaluate. It is a difficult issue because it depends on more than vehicle costs, fuel use, and fuel costs but also depends on maintenance costs and service-life, among other factors. In general, NGVAmerica and its member companies support the inclusion of cost-based metrics for evaluating freight efficiency advancements including TCO and estimates of the cost of pollution reduced.

Category 2: Internal Combustion Engine, Powertrain, Fuels, and Emission Controls

General Comment: Natural gas fuels, such as CNG and LNG derived from either conventional or renewable sources, are especially attractive for stand-alone ICE-powered vehicles in medium- and heavy-duty vehicle classes because of the abundant domestic resource base, cleaner-burning properties, lower carbon emissions, and energy infrastructure resiliency benefits that they offer. For these reasons, DOE should continue to support funding for research and development that advances the continued and increased use of natural for freight transportation.

2.a.1.) This question deals with spark-ignition (SI) fuels and use in ICE-powered medium- and heavy-duty vehicles.

Comment: NGVAmerica supports continued funding for research to address efficiency of SI engines. To the extent that SI technology demonstrates promising results in increasing efficiency and lowering emissions, it is beneficial to continue to focus R&D efforts in this area. We support this focus because of the ability to benefit not only gasoline fueled engines and vehicles but also those operating on natural gas, propane and other fuels well suited for use in SI engines.

2.a.2.) This question relates to gasoline use in compression ignition engines.

Comment: We are generally supportive of continued research that advances the use of higher efficiency internal combustion engines.

2.a.3.) This question relates to dual-fuel engines/vehicles and which applications they are best suited for.

Comment: Dual-fuel natural gas technology continues to evolve and currently is widely used in Europe and Asia. There may be additional opportunities to collaborate with European stakeholders to achieve improvements that are beneficial for future U.S. applications, including in the on-road market as well as off-road high-horsepower applications (e.g., marine, rail, mining) that rely heavily on carbon intensive fuels with high emissions impact today. These other applications provide significant opportunities to reduce emissions in market segments that are likely to be very difficult or impractical to electrify and in which emissions reductions could be significant with alternative fuels like natural gas. In general, NGVAmerica supports R&D to improve efficiency and reduce technology costs associated with vehicle dual-fuel systems using a combination of diesel and natural gas.

2.a.4.) This question asks about interest in gaseous alternative fuels.

Comment: DOE's notice indicates that the VTO's goals include reducing the cost of natural gas medium and heavy-duty trucks as well as reducing gaseous fuel storage costs. We support these goals and commend DOE for recent funding opportunities that have supported the development of newer, more efficient natural gas engines and lower cost fuel storage systems.

NGVAmerica believes that there is continued interest in advancing the use of gaseous alternative fuels like CNG, LNG, and biomethane as alternatives to gasoline and diesel in all MD and HD vehicle classes (i.e. Class 3-8) and in all vehicle platforms and applications. This interest is due to the fact that vehicles operating on these fuels generally deliver extremely low emissions of harmful pollutants and benefit from competitive or lower fuel costs, and less complex emission control systems. We anticipate that this will continue to be the case in the future, particularly as fleets or businesses gain increased access to renewable natural gas supplies as a way to lower greenhouse gas emission and achieve the government and industry's environmental goals.

There are several recent developments that we would like to highlight in order to contribute to this discussion and also to encourage DOE to think about how it can support its efforts with future R&D. These efforts include the advancement of natural gas vehicle fuel containers, development of a larger capacity engines, continuing advancements in engine combustion to further reduce GHG and NOx emissions to Ultra-near-zero level (i.e. 0.01 g/hp-hr or lower), simplification of engine certification, and the development and demonstration of hybrid natural gas freight trucks. New innovations

in hybrid trucks with electric and natural gas systems are emerging to improve the ability of natural gas engines to deliver added power and torque when needed, thus avoiding the need to deploy larger engines. Hybrid trucks provide added efficiency and fulfill the demand in the U.S. market in the absence of a 15 liter or higher-horsepower engine. Several companies also are working on technologies that will utilize natural gas engines that serve as electricity generators onboard freight trucks, delivering even greater efficiency and improved emissions benefits. These systems can be utilized with conventional or renewable natural gas to provide significant benefits in Class 8 trucks and other applications where all-battery electric technologies are likely to be impractical because of weight, space and/or costs.

2.a.5.) This question asks about interest in biofuels.

Comment: Considering that 39% of all natural gas used as a transportation fuel came from renewable sources in 2019, NGVAmerica believes that renewable natural gas (RNG) or biomethane is of significant interest for a broad range of consumers and industries employing MD and HD vehicles (i.e. Class 3-8). With growth increasing over 291% in the past five years, and continuing construction of more RNG production facilities nationwide, it is clear that RNG as a transportation fuel is an important resource for consumers and industries to reduce their carbon footprint as much as 331% compared to diesel.¹ All engines, vehicle platforms, applications, and even existing pipelines using natural gas can make a seamless transition to RNG, which is molecularly equivalent to fossil natural gas.

2b.) DOE asks a series of questions in this section related to interest in biofuels and low-carbon fuels.

Comment: NGVAmerica believes there is significant interest from trucking firms, truck operators, as well as transit bus operators to use fuels and vehicles that lower their carbon emissions and demonstrate the ability to offset emissions in general. There is continued and expanded interest in gaseous renewable fuels that can be used in CNG or LNG vehicles with no changes required and that derive economic value for users because of the opportunity to benefit from credits (e.g. RFS or LCFS credits). As the attached document demonstrates, a significant share of natural gas now used in on-road transportation is renewable natural gas.

Although not mentioned in this section, NGVAmerica believes DOE's expertise could prove useful in encouraging greater use of vehicles that operate on renewable fuels. Current EPA/NHTSA rules do not, in most cases, provide any incentives or vehicle emissions certification credits to manufacturers that produce trucks operating on renewable fuels. This is because the test procedures and certification standard for GHG emissions are tailpipe-based. EPA has resisted expanding the GHG certification rules to account for the fact that an increasingly larger share of renewable CNG and LNG is used

¹See NGVAmerica, *Decarbonize Transportation with Renewable Natural Gas* (April 2020); <https://www.ngvamerica.org/wp-content/uploads/2020/04/NGV-RNG-Decarbonize-FINAL-April-2020.pdf>. Data based on figures reported by the U.S. EPA.

in NGVs. As a result, manufacturers do not receive any regulatory benefit for producing NGVs or other biofuel vehicles despite the fact that these vehicles offer well-to-wheel emission reductions on par or better than electric vehicles. This factor, combined with the advent of regulatory programs that mandate some or all new freight trucks being zero emission vehicles, has created an unlevel playing field and significant market imbalance to the advantage of electric vehicles. This imbalance must be rectified to provide greater flexibility to OEMs to produce cleaner vehicles in general.

2.e - 2.f.) These questions relate to WHR systems and the pressure on gasoline and diesel engine manufacturers to lower NOx and PM emissions while minimizing efficiency losses.

Comment: DOE acknowledges in the Background section that medium and heavy-duty vehicles contribute significantly to PM and NOx emissions in the U.S. Even newer heavy-duty vehicles are a concern for NOx emissions in cities and areas of high traffic when operated at low load operation. The SuperTruck program has shown great potential in efficiency gains from WHR systems and the advances should not be limited to diesel powertrains. Natural gas engines have demonstrated the ability to achieve extremely low levels of PM and NOx without complex emissions controls and without raising the same emissions concerns associated with diesel in low load operation. As such, NGVAmerica sees great potential in a SuperTruck program targeted specifically for a Class-8 truck powered by natural gas. NGVAmerica supports continued efforts to lower emissions of criteria pollutants from *all* new engines -- including those using natural gas -- while also advancing improved efficiency. NGVA also believes that the current debate about how to best drive down such emissions is obscured by the belief that only zero emission vehicles can address urban air quality concerns. The call for zero emission vehicles ignores the significant costs associated with such vehicles, their real-world lifecycle emissions (i.e. PM emissions from tires and braking), as well as the air pollution and GHG impact from upstream emissions. DOE's analysis could help demonstrate that newer internal combustion engines already produce emissions that are near near-zero or in some cases zero-equivalent when all the emissions associated with operating vehicles are considered. Further improvements also contemplated by the DOE as part of its research combined with readily available technology like stop-start technology and other idle reduction strategies can eliminate the emissions that are of the most concern. As already noted, comparisons of vehicles also must consider how new vehicles will be deployed and account for added vehicles or limited work provided by some new vehicle technologies.

2.a.5.) This question asks about advancements at the engine systems level.

Comment: NGVAmerica supports improvements to natural gas engine efficiency that are cost effective. This includes variable valve timing, homogeneous charge compression ignition, high pressure common rail fuel system, and direct injection. Improvements in these areas should strive to achieve results in natural gas engine power density that are on par or better than the latest generation diesel engines.

Category 4: Hydrogen and Fuel Cell Trucks

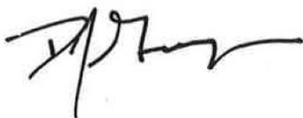
Comment: DOE's notice indicates future R&D focus on hydrogen fuel cell powertrains for medium- and heavy-duty vehicle applications. NGVAmerica supports hydrogen as a transportation fuel and supports DOE's efforts to promote increased production of hydrogen with the goal of reducing total lifecycle carbon emissions. DOE should support R&D related to the opportunities for hydrogen blending in existing natural gas pipelines and future compatibility of hydrogen and natural gas blends in natural gas engines.

Conclusion

NGVAmerica appreciates the opportunity to provide these comments. We commend DOE for undertaking this important public and stakeholder outreach effort. We look forward to working with the DOE on these and other issues to identify ways in which natural gas technology can best meet the changing needs of the freight truck sector and other sectors as well.

Thank you for considering these comments and for supporting the role of natural gas vehicles in medium- and heavy-duty freight energy and operational efficiency R&D planning.

Sincerely,



Daniel J. Gage
President
NGVAmerica

For additional information regarding these comments, please contact:

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