NGVAMERICA
Natural Gas Vehicles for America

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February 23, 2018

Mary Nichols, Chair
California Air Resources Board
1001 I Street
Sacramento, California 95814

RE: NGVAmerica Comments on the Volkswagen Diesel Emissions Settlement and the Environmental Mitigation Trust Implementation

Dear Chairman Nichols:

Natural Gas Vehicles for America (NGVAmerica), the national trade association for the natural gas vehicle industry, respectfully submits the following comments to the California Air Resources Board (CARB) in response to the request for comments to be considered when developing the California Volkswagen (VW) Beneficiary Mitigation Plan.

The VW Environmental Mitigation Trust (EMT or Trust) funds ($422.6 million for CA) provide an extraordinary opportunity for California to accelerate its efforts to reduce nitrogen oxide (NOx) emissions today. The recently released CARB VW Discussion Document indicates that a major priority is to "fully mitigate the excess emissions caused by the subject VW diesel vehicles," using the full 10 years of the Trust to accomplish this. NGVAmerica encourages California to exceed this goal by taking decisive action now to accelerate its achievement of clean air for its people by using technologies that are currently available and that will reduce the most NOx for the funds spent.

The CARB VW Discussion Document shows that the cost to reduce one ton of NOx for an electric vehicle (EV) in the proposed funding segments ranges from $30,000 to $350,000 per ton, while the funding segment that includes the natural gas low NOx vehicles ranges from $5,000 to $30,000 per ton. Moreover, the segment that includes natural gas engines will reduce 71 percent of the desired NOx reductions for $60 million, while the EV segments take $290 million to reduce 29 percent of the desired NOx reductions.

Despite the significant benefit and cost-advantage of low-NOx natural gas vehicles, California inexplicably devotes a much greater share of its environmental mitigation funds for electric vehicles. In order to reduce the most NOx emissions, the funding provided for natural gas low NOx engine vehicles should be increased. Natural gas vehicles (NGVs) should be added to the EV only segments, thereby delivering on the intent of the VW Settlement and helping California to deliver on providing cleaner air for its citizens now.

It is encouraging that many heavy-duty truck fleets recognize the air quality, economic and independence from foreign oil benefits of natural gas vehicles, including many operating in California. These fleets include national trucking and refuse fleets (FedEx, Frito-Lay, Penske, Ryder, Schneider, UPS, Waste Management and many others).

The VW EMT funds provide an extraordinary opportunity for California to cost-effectively accelerate the transition to cleaner vehicles and lower emissions. Commercially available natural gas vehicles offer the best solutions today for addressing the goals of the EMT, delivering the most nitrogen oxide emission reductions for the least cost.

Additionally, if renewable natural gas (RNG) is used, life cycle greenhouse gas emissions from NGVs are reduced further. Using low NOx NGVs today allows California to accelerate achievement of clean air for its people now, while complementing its transition to zero emissions applications in the future.

Current State Beneficiary Mitigation Plans

Seventeen states have released draft VW Mitigation Plans and NGVAmerica has reviewed these plans and offered comments to the states. NGVAmerica believes the Colorado Plan provides an excellent model for other states that wish to segment their funding, maximize the use of alternative fuels, and provide parity among alternative fuels (https://www.colorado.gov/pacific/sites/default/files/AP_VW_Beneficiary_Mitigation_Plan.pdf).

In allocating its funds, Colorado did not pick a preferred alternative fuel (diesel is excluded except for fleets of 9 or less trucks) and kept the categories simple and broad. The $18M set aside by Colorado for Alt Fuel Trucks/School and Shuttle Buses funds all alternative fuels at 40% of the vehicle cost for government and public entities, while private vehicles are funded at 25% of the vehicle cost (not the 75% allowed for EVs because that would result in fewer vehicles and less NOx reductions, and there are other sources for EV funding).

California has stated in their Discussion Document that they will reimburse non-government-owned fleets at the levels specified in the Trust. NGVAmerica strongly recommends that California consider adopting a similar "parity" approach to alternative fuel vehicles, instead of following the percentages suggested in the Trust.

Colorado has other funding they can apply to Transit applications, so it created a structure that augments the Trust funding to be used for transit applications with additional state monies. Colorado also set aside $12.2M in Flex Funds to support projects in the segments that turn out to be successful and oversubscribed. For the DERA option, Colorado plans to consider funding projects involving liquefied natural gas (LNG) for non-road engines, mining trucks and locomotives.

Additional Options for Vehicle Scrappage

NGVAmerica also recommends that CARB consider the following vehicle scrappage options in the Plan:

- Increase the options for scrappage beyond a strict replacement of a current fleet vehicle (e.g., allow a fleet to acquire an older vehicle from another fleet or allow a fleet to exchange one of its newer vehicles for another fleets older vehicle that is then scrapped)
- Since the Trust does not specify the fuel of the scrappage vehicle, allow natural gas vehicles that meet the year criteria to be scrapped and replaced with new NGVs (which CA plans to do)

Use the Most Current Emissions and Cost Benefit Calculation Tools

The Argonne National Laboratory's AFLEET tool should be used to calculate vehicle / fuel type emissions since this tool has recently been updated to include current data on all vehicles and fuels including in-use emissions data. The AFLEET Tool 2017 updates include:

- Added low-NOx engine option for CNG and LNG heavy-duty vehicles
- Added diesel in-use emissions multiplier sensitivity case
- Added Idle Reduction Calculator to estimate the idling petroleum use, emissions, and costs for light-duty and heavy-duty vehicles

- Added well-to-pump air pollutants and vehicle cycle petroleum use, GHGs, and air pollutants
- Added more renewable fuel options
- AFLEET Tool spreadsheet and user manual at: http://greet.es.anl.gov/afleet_tool and tool link is: http://www.afdc.energy.gov/tools

ANL has also just released a new vehicle emissions calculator (HDVEC) to provide state officials and fleet managers with an accurate tool to gauge emissions reductions across various medium- and heavy-duty vehicle project options affiliated with the Volkswagen Environmental Mitigation Trust Settlement. The HDVEC tool is available at: http://afleet-web.es.anl.gov/hdv-emissions-calculator/.

Summary of NGVAmerica's Recommendations for EMT Funding

- ✓ Given that the EMT was created because of NOx pollution associated with non-compliant diesel vehicles, we believe that the funding should be set aside for clean, ***alternative fuel*** **vehicle projects that focus on maximizing NOx reduction for the funds spent**
- ✓ Provide a larger incentive and greater overall funding for medium- and heavy-duty engines that deliver **greater NOx reductions than currently required** for new vehicles and engines
- ✓ Target funding for technologies that have demonstrated the ability to deliver actual **lower in-use emissions** when operated in real-world conditions
- ✓ Provide the **highest level of funding to applications that produce the largest share of NOx emissions** (in most regions this means prioritizing for short-haul, regional-haul and refuse trucks)
- ✓ Prioritize funding for **commercially available products that are ready for use**
- ✓ Prioritize funding for **clean vehicles rather than fueling infrastructure**
- ✓ **Scale funding to incentivize the cleanest engines available** – at a minimum, provide parity among alternative fuels by following a version of the Colorado VW Plan that funds non-diesel alternative vehicles in the private sector at 25% of the cost of the vehicle and public sector vehicles at 40%
- ✓ Ensure that funding incentivizes adoption by **both public and private fleets**
- ✓ Prioritize projects that include **partnerships that provide a match** such as a CNG or LNG station being built in locations that will receive the VW funding
- ✓ **Accelerate the funding** in the early years to maximize the NOx reduction benefits
- ✓ Use vehicles emissions measurement tools that reflect current technologies and performance under real world operation duty cycles – **Argonne National Laboratory's AFLEET tool and HDVEC tools** are the most current tools available

Compared to other alternative fuels and to diesel vehicles, natural gas vehicles that are commercially available today, offer the best solution for addressing the goals of the EMT and delivering the most nitrogen oxide (NOx) emission reductions for the lowest cost.

The following pages outline key facts related to vehicle emissions, total cost of ownership, current availability, and NGVAmerica's recommendations on how EMT funds can be allocated effectively for reducing emissions.

The Need to Take Meaningful Action Today

The funding available through Volkswagen's Environmental Mitigation Trust comes at a time when it is critical to address transportation emissions. The American Lung Association's "State of the Air 2016" report found that air pollution continues to be a pressing concern with more than half of all Americans—166 million people—living in counties where they are exposed to unhealthful levels of ozone and particulate pollution.

Medium- and heavy-duty on-road vehicles are the number one source of ozone-forming emissions of nitrogen oxides (NOx) in almost every metropolitan region in the U.S., therefore there is considerable opportunity to develop and deploy funding programs that make an immediate and tangible impact on air quality and related public health issues.

Approximately 50% of Americans live in areas with air that is unhealthy to breathe

Medium- and heavy-duty vehicles are the #1 source of smog

Sustainable, Responsible, Available: Natural Gas Vehicles

Today's natural gas vehicles (NGVs) are proven technologies that can uniquely, immediately, and cost-effectively transform our nation's medium- and heavy-duty transportation sector. The advantages of natural gas as a transportation fuel include its domestic availability, widespread distribution infrastructure, low cost, and inherently clean-burning qualities.

In these comments NGVAmerica presents the compelling reasons that states should prioritize funding for NGVs to *maximize the impact* of the available funding. As your organization is aware, the EMT was set up to fund projects that make an impactful reduction on NOx emissions to mitigate the excess emissions currently in our air from the non-compliant light-duty diesel vehicles VW sold. NGVAmerica strongly believes that NGVs are the best solution to meet the core goals put forth by the Volkswagen EMT funding. NGVs are:

1. **Sustainable:** NGVs maximize long-term emission reductions
2. **Responsible:** NGVs extend the funding and foster economic development
3. **Available:** NGVS meet the diverse operating requirements of every fleet application

1. Sustainable: NGVs Maximize Long-Term Emission Reductions

- **Key Point:** Today's natural gas medium- and heavy-duty engines provide *unmatched* reductions of smog-forming emissions of nitrogen oxides (NOx).

"Near Zero-Emissions": EPA and CARB Certified a Heavy-Duty Natural Gas Engine to 0.02 g Standard

In September 2015, the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) certified the world's first heavy-duty engine that emits oxides of nitrogen (NOx) at levels so low that they are considered at "near-zero" (0.02g NOx/bhp-hr). This is the cleanest commercially available heavy-duty truck engine available in the market today, offering the ability to reduce emissions 90% below even the most stringent U.S. EPA standards.

Today's natural gas engines offer a 90% NOx reduction over the EPA's strictest emission standards, making them the cleanest commercially available technology

The "Game Changer" report shows that "Near-Zero" NGVs are cleaner than "Zero-Emission" All-Electric trucks

NGVs Have Lower NOx Emissions Than All-Electric Trucks

The emission benefits of the new "Near-Zero" engine are well documented in the 2016 *Game Changer* report issued by Gladstein, Neandross and Associates (GNA)[1]. The GNA report indicates that a truck or bus equipped with a natural gas engine that has been certified to the 0.02 g/bhp-hr Optional Low NOx Standard has tailpipe NOx emissions that are comparable to – or possibly lower than – the amount of NOx emitted to produce electricity used to charge a comparable heavy-duty All-Electric Truck.

[1] Gladstein, Neandross & Associates, *Game Changer Technical White Paper* (2016) http://ngvgamechanger.com/, Section 6.4 and Appendix 1. Emissions of low-NOx natural gas engines produce NOx emissions that are comparable to or lower than similar electric drive vehicles in all 50 U.S. states when considering upstream NOx.

Heavy-duty drayage trucks:

Diesel trucks tested in study exceed certification level

<u>Critical Insight</u>:
Study Finds that Natural Gas Engines Outperform Diesel Engines in Real World Situations

Natural gas (NG) engines today meet an optional Low NOx standard that is ten times cleaner than the standard required for new diesel and natural gas engines. However, the in-use emission benefits of NG engines could be even more significant.

A recent report published in *Environmental Science and Technology*[2], evaluated in-use emissions of earlier model year NG vehicles and found that NG engines performed much better in real world conditions (i.e., operating within city limits in low-speed, high-idling situations), registering NOx levels that were 96% lower than levels produced by tested diesel engines equipped with the latest emissions controls. The study found that diesel NOx emissions operating in similar conditions produced emissions that were 5 -7 times higher than in-use certification limits in some cases.

Related Recommendations for EMT Funding

- ✓ **Provide a higher level of funding for technologies that are proven to exceed federal emission levels for nitrogen oxides**
  - Vehicles with engines certified to California's Optional Low-NOx Standard should receive the highest level of funding (e.g., 25% in the case of private sector vehicle replacements)
  - Use the state's approved DERA plan to fund low-NOx natural gas trucks (i.e., 35% of the replacement cost for private vehicles equipped with low-NOx engines)

- ✓ **Provide the highest level of funding to applications that will reduce the largest share of NOx emissions**
  - Evaluate the main mobile source(s) of NOx emissions in urban and non-attainment areas (Note: In most regions, this means prioritizing funding for short-haul, regional-haul, and refuse trucks)
  - Do not segment the funding – fund the projects that best achieve the most NOx reductions

[2] *Environ. Sci. Technol.*, **2015**, *49* (8), pp 5236–5244 (Emission Rates of Regulated Pollutants from Current Technology Heavy-Duty Diesel and Natural Gas Goods Movement Vehicles).

2. Responsible: NGVs Extend the Funding and Foster Economic Development

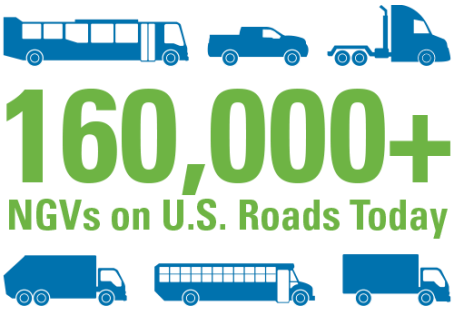
- **Key Point:** NGVs are far more cost-effective in delivering emission reductions than other alternative fuel options, such as hybrid and electric vehicles.

Due to lower fuel and maintenance costs, NGVs offer an 18 to 24 month payback. As production increases and fuel tank prices come down, vehicles will become less expensive and enjoy a shorter payback period

NGVs Offer a Fast Return on Investment

While NGVs typically cost more than gasoline or diesel vehicles upfront (largely due to the cost of high-pressure and insulated fuel tanks which are necessary to store CNG or LNG), owners and operators of high mileage vehicles typically see a pay back in as little as 18–24 months. This is due to:

- **Lower Fuel Costs**: Natural gas fuel prices have historically had a significant discount relative to gasoline and diesel and offer more stability compared to the costs of petroleum based fuels. Lower oil prices have recently reduced the differential in price, but according to the Energy Information Agency, the long-term outlook is for natural gas prices to remain stable and low, while volatility and higher prices return for gasoline and diesel fuels. For many users, the savings in fuel costs can translate into significant savings over the life of a vehicle, depending on fuel efficiency and the number of miles driven. The greatest savings are currently being seen in heavy-duty, high mileage fleets.
- **Lower Maintenance Costs**: NGVs are easier and cheaper to maintain than diesel trucks because they have:
    - No diesel particulate filter (DPF)
    - No DPF regeneration or waste disposal
    - No selective catalytic reduction (SCR)
    - No diesel emission fluid (DEF)



High-profile fleets across the U.S. are using natural gas vehicles in their everyday operations, transporting passengers, and hauling waste, packages, beverages, and other goods

NGVs Have Been Road-Tested by Leading Fleets

There are more than 160,000 NGVs on U.S. roads today, spanning all weight classes and vehicle applications. The adoption of NGVs has been pioneered by several high-profile fleet operators, including UPS, Anheuser-Busch, Kroger, FedEx, Frito Lay, Waste Management, LA Metro, all of which performed exhaustive analysis to determine the best vehicle and fueling options for their fleet based on application, range, duty cycle, and payload.

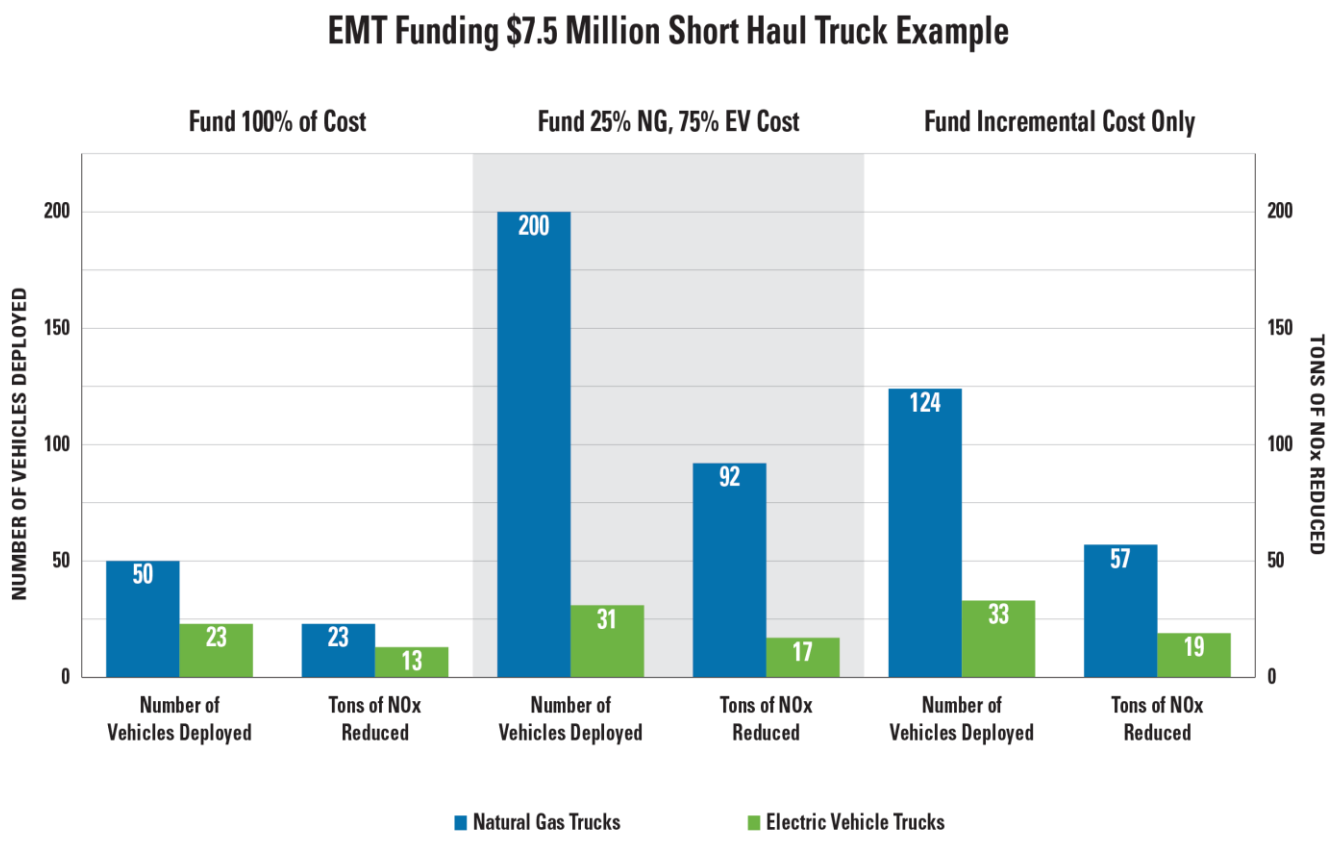
Given the significant fuel and emission reductions realized by early adopters, the popularity of NGVs has continued to build in the U.S., with 20% of all U.S. transit buses now running on CNG or LNG, 35 airports operating NGVs in their private fleets or championing policies that encourage use by private fleets, and more than 50% of new refuse trucks running on natural gas.

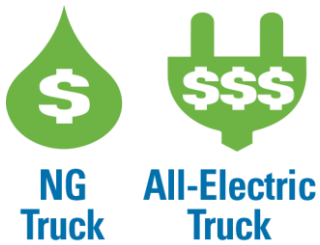
To fuel these vehicles, natural gas infrastructure is rapidly expanding with more than 1,640 CNG and 123 LNG fueling stations operating today.

Dollar-for-Dollar Natural Gas Delivers Greater Numbers of Total Vehicles and Greater Total Tons of NOx Emission Reductions

This is illustrated by the chart below which looks at several different funding options for natural gas and electric vehicles including providing 100% of the cost of new, replacement vehicles for public fleets, using the maximum funding levels specified in the settlement for natural gas and electric vehicles purchased by private fleets, or funding only the incremental cost of new, replacement vehicles. In each case, the deployment of natural gas vehicles (e.g., regional haul trucking, refuse trucks, and transit buses) will provide the most NOx emissions reduction to comply with the EPA's latest national ozone standards.

Chart: Heavy-Duty Truck Deployment & NOx Reduction Comparisons Under Different Funding Scenarios





<u>Critical Insight:</u>

Comparable All-Electric Vehicles Cost 2-3x More Than an NGV

While actual cost depends on the application, an all-electric medium- or heavy-duty vehicle usually costs two to three times the amount of a comparable vehicle powered by a 0.02 g NOx natural gas engine. As noted above, funding heavy-duty NGVs delivers greater emission reductions than similar projects involving all-electric trucks, and they offer the best ability to reduce emissions on a large scale because the funding will extend further.

Related Recommendations for EMT Funding

✓ **Ensure that funding incentivizes adoption by both public and private fleets**

- While it might be tempting to fund public vehicles at the 100% level, this will limit the total number of deployed vehicles and therefore lessen the overall emission reductions
- Funding levels should be large enough to offset the incremental cost (as compared to cost of a new diesel vehicle) of new, cleaner vehicles, as well as to address the fact that replaced vehicles must be scrapped
- For private fleets, use available state funding sources to supplement the Volkswagen funds to ensure that new, cleaner trucks are truly incentivized by covering the full incremental cost (compared to baseline diesel vehicles) and to address economic loss associate with scrappage

✓ **Prioritize funding for clean vehicles rather than fueling infrastructure**

- Funding should be used to incentivize fleets and vehicle acquisitions where existing fueling infrastructure exists to better support investments that have already been made
- If fueling infrastructure needs to be developed, funding should be secured as part of private-public partnerships. Using the funding in this way will encourage additional economic development in the state and increase the availability of stations for future deployments

3. Available: NGVs Meet the Diverse Operating Requirements of Every Fleet Application

❖ **Key Point:** Dozens of models of medium- and heavy-duty low-emission natural gas vehicles and engines are commercially available from reputable, world-known OEMs with established sales and service networks.

Wide Array of NGV Options Commercially Available

There are many natural gas vehicle options available from several original equipment manufacturers (OEM). These vehicles can be purchased from the dealership through a process that has been streamlined for the customer.

Many other medium- and heavy-duty vehicle options are available through small vehicle modifiers (SVM). These companies manufacture conversion systems that have been certified and approved by the U.S. Environmental Protection Agency and/or the California Air Resources Board. These approved systems can be installed on new and used vehicles to run on natural gas.

Additionally, Cummins Westport currently offers the 6.7L ISB-G, 8.9L ISL-G and the 11.9L ISX-G natural gas engines. These spark-ignited engines are used in a variety of applications, including refuse trucks, transit buses, cement trucks, short- and regional-haul tractors, delivery trucks, school buses, and shuttles. Roush offers a school bus engine that is certified to the Low-NOx standard of 0.10. Retrofit and repower options are also available from a variety of manufacturers.

For a full list of EPA and CARB certified engines, visit www.ngvamerica.org/vehicles/vehicle-availability. A list of available NGV manufacturers and conversion companies follows.

HD Vocational OEMs
- Autocar Truck
- Capacity
- Crane Carrier
- Elgin
- Johnston
- Kalmar
- McNeilus
- Mack
- Peterbilt
- Power Solutions Int'l.
- Schwarze
- Tymco

HD Truck OEMs
- Cummins Westport
- Freightliner
- Kenworth
- Mack
- Peterbilt
- Volvo

HD Bus OEMs
- Blue Bird Bus
- DesignLine
- El Dorado
- Gillig
- New Flyer/NABI Bus
- NOVA Bus
- Motor Coach Industries
- Thomas Built Bus

HD Retrofit/ Repowers
- American Power Group
- Clean Air Power
- Diesel 2 Gas
- Fyda Energy Solutions
- NGV Motori
- Omnitek Engineering

MD Retrofits
- AGA Systems
- Altech-Eco
- Crazy Diamond Performance
- Greenkraft
- Landi Renzo USA/Baytech
- M-Tech Solutions
- NAT G
- NGV Motori USA
- PowerFuel Conversions
- Roush CleanTech
- STAG
- Westport Fuel Systems
- Zavoli

Fuel Systems
- Agility Fuel Systems
- Mainstay
- Momentum Fuel Technologies

Critical Insight: Heavy-Duty Electric and Fuel Cell Vehicles are Not Commercially Available

As of today, three unique fuel-technology combinations hold the most promise to successfully transform America's HDV transportation sector to zero and near-zero emissions:

1. Near-zero-emission internal combustion engines fueled by conventional or renewable natural gas
2. Zero-emission battery-electric-drive systems
3. Zero-emission hydrogen fuel cell systems

While battery-electric and hydrogen fuel cell systems can offer extremely low emissions profiles, the lack of commercially available heavy-duty and limited medium-duty products and charging/fuel distribution networks makes implementation in the near future impractical. Furthermore, these vehicles are being developed by niche, start-up companies and have only been used in early test programs; comparatively, medium- and heavy-duty NGVs from major OEMs have been widely, commercially available in dozens of applications for over two decades. Near-zero-emission internal combustion engines fueled by conventional or renewable natural gas are the only option to immediately and cost-effectively provide extremely low NOx and GHG emissions in high-impact HDV sectors.

Related Recommendations for EMT Funding

✓ **Prioritize funding for commerically available products**
- Given that the NOx emissions from Volkwagen vehicles are already in the air, funding should be concentrated to projects that allow us to deploy the cleanest vehicles available today (i.e., not pre-commercial or research and development projects)

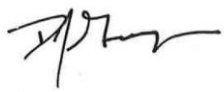
✓ **Scale funding to incentivize the cleanest engines available**
- Provide greater funding for medium- and heavy-duty engines that deliver NOx reductions over and above what is currently required for new diesel vehicles
- Given that the EMT was created because of NOx pollution associated with non-compliant diesel vehicles, we believe that the funding should be set aside for clean, alternative fuel vehicle projects and should not be used to fund more diesel fueled vehicles

Let's Transform Clean Transportation Together

NGVAmerica and its members are eager to serve as a resource to assist the State of California in its evaluation and development of the state's VW Beneficiary Mitigation Plan. We strongly encourage the state to recognize the unmatched role that natural gas vehicles play in delivering NOx emissions reductions required by the Trust.

NGVAmerica welcomes the opportunity to meet with you to provide further information and analysis on the economic and environmental benefits of natural gas vehicles in California. Please contact Jeff Clarke, NGVAmerica General Counsel & Regulatory Affairs Director at 202.824.7364 (jclarke@NGVAmerica.org), or Sherrie Merrow, NGVAmerica State Government Advocacy Director at 303.883.5121 (smerrow@NGVAmerica.org) to set up a meeting and for additional information.

Sincerely,



Daniel J. Gage
President

Summary of NGVAmerica's Recommendations for EMT Funding

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