

OEM Related Comments



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Jacqueline Gelb
VP, Government Relations

December 22, 2017

The Honorable Michael S. Regan
Secretary
North Carolina Department of Environmental Quality
217 W. Jones Street
Raleigh, NC 27603

Dear Secretary Regan,

I write to encourage you to include the renewal and replacement of diesel school buses and heavy-duty trucks when the State of North Carolina prepares and submits its Beneficiary Mitigation Plan to the Trustee overseeing the Volkswagen Consent Decree. The \$87 million North Carolina is scheduled to receive for diesel mitigation activities represents a tremendous opportunity to protect the environment and improve air quality across the state.

The terms of the settlement allow North Carolina to seek and receive reimbursement of 100% of the purchase price of new, clean diesel-powered buses and heavy-duty trucks if they replace older, diesel powered vehicles purchased prior to 2007. Leveraging those generous terms would permit the state to renew the aging fleet of buses that transport tens of thousands of students, daily, to schools across North Carolina. Providing safe transport powered by the diesel engines that meet or exceed the EPA's most stringent standards would benefit our state's most vulnerable population.

Heavy-duty diesel trucks perform a myriad of critical municipal services, from hauling garbage to spreading salt and building infrastructure. Yet, budget realities mean that fleet renewal is perennially low on the list of priorities. Replacing the typically ancient trucks that keep our communities running with new, more capable and environmentally friendly trucks would benefit all taxpayers. And, since new trucks emit a tiny fraction of the pollutants produced by pre-2007 models, the measurable environmental benefits would be significant.

According to Ward's Automotive data, North Carolina has over 17,000 pre-1998, diesel-powered school buses and trucks on its roads. These vehicles emit at least **4 grams** of NOx per brake-horsepower hour of operation, compared with 2018-compliant diesel-powered trucks and buses, which emit less than **two-tenths of a gram** of NOx per brake-horsepower hour – or **95% less** NOx than the pre-1998 vehicles.

Because of the significant NOx reduction that can be achieved by taking these older buses and trucks off the road, I believe North Carolina should use these funds to subsidize replacement of the older vehicles with real-life, ready-today technologies: new, 2018 compliant, diesel, propane or gas-powered school buses, or trucks.

Thank you for your time and efforts. Please let me know if I can be of any assistance.

Sincerely,

Jacqueline Gelb



Caterpillar Inc.
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North Carolina Department of Environmental Quality
Brian C. Phillips
Mobile Sources Compliance Branch Supervisor
217 West Jones Street
Raleigh, NC 27603

December 6th, 2017

Re: Caterpillar Inc. comments regarding DEQ's Request For Information on the Proposed VW Environmental Trust Beneficiary Mitigation Plan.

Caterpillar appreciates the opportunity to comment on North Carolina's proposed allocation plan for the State's share of the \$2.9B Mitigation Trust Fund (MTF) established under the Volkswagen Consent Decree. Pursuant to section 2.0.3 of the 2016 Consent Decree¹, the *primary* purpose of the Mitigation Trust Fund is to fund Eligible Mitigation Actions which have the goal of reducing NOx emissions in the United States. Caterpillar believes that North Carolina's plan could meet this objective by focusing funds towards Eligible Mitigation Actions which are more cost effective for the NOx reduction benefits.

Comment 1: North Carolina should invest its Mitigation Trust Funds in cost-effective Eligible Mitigation Actions which would realize greater NOx reductions and better meet the stated purpose of the Mitigation Trust Fund.

Marine, locomotive, and nonroad equipment have significantly longer service lives, higher load factors and higher usage rates than on highway vehicles. As a result, emission reduction solutions offered by Caterpillar for these sectors have cost effectivities that are up to 200 times better. For nonroad repowers, there are additional commercial options available with a waiver sought under EPA's DERA (Diesel Emissions Reduction Act) program. DERA funding for State programs is available under the Mitigation Trust Fund (MTF) action 10.

Many States have allocated a large portion of their Mitigation Trust Funds to fund electric and CNG powered on-highway vehicles, including school busses. A comparison of cost effectivity of these Mitigation Actions to marine, locomotive, and nonroad options shows that electric and CNG obtain less NOx emissions reductions for a much higher cost.

North Carolina may be considering investing funding towards CNG school buses, when the cost effectivity for NOx reduction is unreasonably high relative to other mitigation options. Total cost effectivity for school buses has been calculated by proponents of CNG buses at a staggering \$440,000/ton² (lifetime).

¹ Order Granting the United States' Motion to Enter Proposed Consent Decree, *In re: Volkswagen "Clean Diesel" Marketing, Sales Practices, and Products Liability Litigation*, Case No. 3:15-md-02672 (N.D. Cal., Oct. 25, 2016) ("2016 Consent Decree")

² http://www.CNGamerica.org/wordpress/wp-content/uploads/2017/06/CNGA-One-Sheet_School-Bus.pdf

There are several factors contributing to this poor cost effectivity.

School buses:

1. Experience relatively low usage, approximately 12,000 mi/year on average³.
2. Experience relatively low engine load factors during usage.
3. Are relatively new with an average age of about 9 years and thus have engines that are relatively lower emitting compared to other sectors.⁴

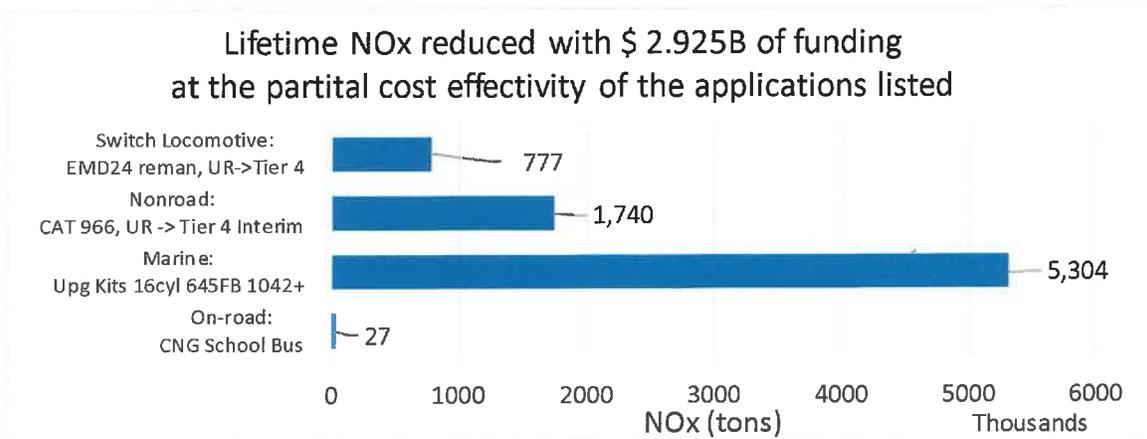


Figure 1: NOx emission reductions available with \$8.79 of MTF

Figure 1 above illustrates the difference in NOx reductions that could be achieved by applying the same amount of MTF towards reductions in different mobile sectors.

In addition to the higher cost per ton of NOx reduced, electric vehicle grants may be too optimistic about the actual environmental benefits. Currently 58.6%⁵ of the electric generation in the State comes from the combustion of fossil fuels. Only 6.3% of North Carolina’s electricity is renewable. While North Carolina and the nation progress slowly towards the decarbonization of the electrical grid, the current sources of renewable electricity generation in the State are typically fully utilized; therefore, sudden increases in electrical demand (such as would occur by adding more EV’s) will likely be met entirely by increased fossil fuel combustion. In contrast, current diesel engines have a CO2 and NOx footprint per kWh that is comparable or slightly better than the average combustion electrical generation source in North Carolina.

One of the intended goals of the 2016 Consent Decree is to mitigate the total, lifetime excess NOx emissions from the Subject Vehicles to the 2016 Consent Decree. Accordingly, we recommend that North Carolina focus on targeting the maximum NOx reductions that can be achieved with the options available today to achieve that mitigation goal, rather than seeding technology to further a particular industry which will not result in immediate and/or significant emissions benefit.

³ <http://www.americanschoolbuscouncil.org/issues/environmental-benefits> Note that NGV America uses an estimate of 15,000 mi/year for their cost effectivity calculations.

⁴ <http://files.schoolbusfleet.com/stats/SBF0317-MaintenanceSurvey.pdf>

⁵ U.S. Energy Information Administration, North Carolina, July 2017 Electric Generation Profile: <https://www.eia.gov/state/?sid=NC>

Comment 2: DEQ should invest a proportional amount of its allocated Trust Fund towards Eligible Mitigation Actions in the nonroad space of marine, locomotive, and nonroad mobile sectors, which have been shown to have better cost effectivity for the NOx emissions reduced in line with the stated purpose of the Mitigation Trust Fund.

The North Carolina “emissions inventory” chart, Figure 2 below, is generated from data published by the EPA⁶. It shows that 49.8% of NOx emissions in North Carolina arise from the off-road sectors of marine, locomotive, and nonroad mobile sources combined. We believe these sectors should be addressed by the Mitigation Trust Funds because these sectors represent a significant portion of the emissions in North Carolina and far greater reductions in NOx emissions can be realized through Eligible Mitigation Actions in these sectors. Eligible Mitigation Actions in these sectors have the potential to help North Carolina realize greater NOx reductions compared to other Eligible Mitigation Actions.

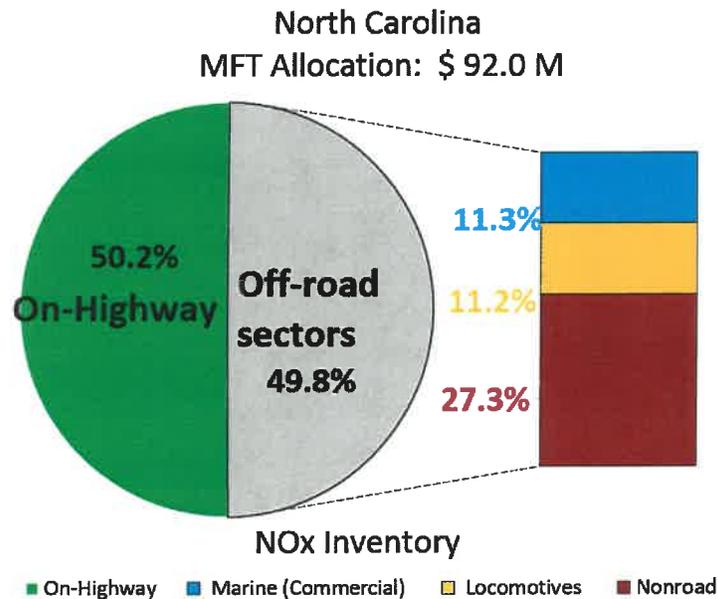


Figure 2: North Carolina Mobile NOx sources

According to the EPA Green Book⁷, North Carolina is listed as being in Maintenance for Ozone. DEQ should focus on areas that historically have NAAQS attainment issues and those areas that receive a disproportionate quantity of NOx emissions. The most populated cities typically have the highest on-road NOx emissions and also the highest number of VW vehicles that are involved in the consent decree. Caterpillar’s emission solutions are more cost effective and reduce far more annual tons of NOx

⁶ USEPA National Emissions Inventory 2014;
<https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data>

⁷ USEPA Green Book, 8-hour Ozone (2008)
<https://www3.epa.gov/airquality/greenbook/hbtc.html>



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than other MTF options. Figure 3 below provides a comparison of NOx reduction cost effectivity between some key products that Caterpillar can offer in metropolitan areas.

Lifetime NOx reduced with \$ 2.925B of funding and the partial cost effectivity of the applications listed

Possible Options	Cost per unit	VW MTF Funding percent	Partial MTF Cost per unit	Est out of pocket %	NOx Reduced tons/year	Service Life* years	Lifetime NOx tons	Total Cost Effectivity \$/ton	Partial Cost Effectivity \$/ton	Proposed Qty. ** units	Total Cost all units	Partial MTF Cost all units	NOx Reduced tons/year	Lifetime NOx tons
On-road: CNG School Bus	\$ 148,000	25%	\$ 37,000	139%	0.067	5	0.34	\$ 441,133	\$ 110,283	79,054	\$ 11.7000 B	\$ 2.9250 B	5305	26523
Caterpillar Nonroad Options														
Marine: Ugg Kits EMD 16cyl 645FB 1042+	\$ 475,000	40%	\$ 190,000	-29%	14.98	23	344.51	\$ 1,379	\$ 552	15,395	\$ 7.3125 B	\$ 2.9250 B	230593	5303642
Nonroad: Cat 777C C32 Repower, UR->Tier 2	\$ 265,000	40%	\$ 106,000	2%	8.29	10	82.91	\$ 3,196	\$ 1,279	27,594	\$ 7.3125 B	\$ 2.9250 B	228774	2287736
Switch Locomotive: EMD30 remanufacture, UR->Tier 4	\$ 2,400,000	40%	\$ 960,000	31%	14.05	20	281.08	\$ 8,538	\$ 3,415	3,047	\$ 7.3125 B	\$ 2.9250 B	42821	856416

* Quantities are for cost comparison purposes. Affected States may not have the listed quantity of units within the State.
 ** Service life for a school bus is approximately 15 years, however, since school buses within 5 years of retirement are more likely to be replaced, the emissions benefit is calculated over those 5 years.
 *** Requires state to be granted a DERA Waiver for repowering nonroad equipment to Tier 2.

Figure 3: Cost Effectivity Comparison

Total Cost Effectivity is the total cost of the retrofit, repower, or replacement, divided by the lifetime NOx reduction.
 Partial Cost Effectivity is the funded portion of retrofit, repower, or replacement, divided by the lifetime NOx reduction.

Figure 3 above, illustrates the Cost Effectivity of Caterpillar offerings compared to CNG School Buses. If all \$2.93B of the MTF money was spent on each of the listed products, it shows that the listed nonroad options could yield up to 200 times more NOx reductions, in tons, for the same money spent. This difference is due to the significantly better partial cost effectivity of the off-road options as shown in the yellow column above. Although not a mandate of the MTF, the off-road reductions listed above also result in significant PM reductions.

Comment 3: ADEQ should consider distributing its proposed allocation for funding of emission reductions for marine vessels, switcher locomotives, and nonroad equipment in the top NOx counties in North Carolina as these Eligible Mitigation Actions provide the most cost-effective NOx reductions and would benefit the urban areas in North Carolina most impacted by the VW, Audi and Porsche vehicles.

Of the Trust Fund's list of Eligible Mitigation Actions, repowers and upgrade kits for marine vessels, switcher locomotives and nonroad equipment provide the most cost-effective NOx reductions for North Carolina. The following are just some examples of Eligible Mitigation Actions in these areas.

Switch Locomotives

North Carolina has approximately 115 switcher locomotives in the State that have various reduction options available under the Eligible Mitigation Actions of Appendix D-2, section (3)(d)(1).



Remanufacture Switch Locomotive EMD24 to Tier 4

Total cost effectivity: \$ 9,411/Ton NOx
Partial cost effectivity: \$ 3,765/Ton NOx

Nonroad Mobile Machines

Caterpillar has been developing and providing retrofits to reduce emissions from older equipment since 2004. We have engineered 31 machine solutions that upgrade nonroad machines to Tiers 2, 3, and 4. Mitigation Trust Fund Appendix D-2, option 10, allows States to fund retrofit programs through EPA's Diesel Emissions Reduction Act (DERA). Options that replace only the engine rather than the entire machine achieve better cost effectivity while significantly lowering the emissions of the engine/machine.

The following machines shown below with unregulated engines can be repowered to Tier 4, however, within the State, 31 machine solutions from Caterpillar could be applied hundreds of machines under the DERA program, if a waiver is granted.

We recommend North Carolina apply for an EPA waiver to allow machines to be repowered to Tier 3 in addition to Tier 4. While upgrades to Tier 4 seem optimal, due to the differences in technologies utilized between Tier 3 and Tier 4, there are many more options available for Tier 3 repowers and they provide better cost effectivity as well.

Nonroad Repowers – Upgrading from unregulated to Tier 4



657 Scraper, unregulated to Tier 4 (dual engine)

Tractor cost effectivity:
Total cost effectivity: \$ 1,154/Ton NOx
Partial cost effectivity: \$ 462/Ton NOx

Scraper cost effectivity:
Total cost effectivity: \$ 1,640/Ton NOx
Partial cost effectivity: \$ 656/Ton NOx



966 Loader, Unregulated to Tier 4
Total cost effectivity: \$ 4,204/Ton NOx
Partial cost effectivity: \$ 1,682/Ton NOx

Marine Tugs

Caterpillar has a very large selection of emission reduction solutions for marine under Eligible Mitigation Actions of Appendix D-2, section (4)(d)(1). Marine repowers have the best cost effectivity due to their continual rate of use. States like North Carolina are less affected by seasonal issues therefore tugs run all year.



EMD 645FB 1042+ upgrade kit w/ NOx reduction
Total cost effectivity: \$ 1,379/Ton NOx
Partial cost effectivity: \$ 551/Ton NOx

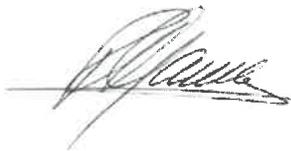
Closing Remarks

Large engines used in marine, locomotive, and nonroad mobile equipment, are often an “invisible fleet”. Buses and trucks receive higher visibility for funding for replacement and retrofits, since they are seen and used daily by the public. Trucks are the starting and end points of a transportation chain that frequently involve locomotive and marine in the middle. But despite a lower visibility for replacement and retrofits, locomotive, marine and nonroad equipment frequently have long service lives, up to 40 years for some applications. In contrast, school buses typically have a service life of 16 years and public metro buses typically have a service life of 12 years. There is equipment running in this invisible fleet that is over 50 years old. Without incentivizing the replacement or retrofit of engines in this invisible fleet, owners and operators will continue to overhaul the equipment to the same unregulated status for future decades. This is an important sector that makes up almost half of North Carolina’s Mobile Source NOx emissions.

Based on these facts, Caterpillar recommends North Carolina consider the proposed allocation of funds from the VW Mitigation Trust Fund, to significantly improve the NOx reductions in the state. This can be achieved through an allocation to Options 10 (DERA), Option 3 (Freight Switchers), and Option 4 (Marine Tugs and Ferries). The significantly better cost effectivity of the solutions available under these type of emission solutions justifies a significant allocation to these off-road sectors. This kind of investment will yield the greatest benefit to the State and help North Carolina provide improved air quality.

Caterpillar appreciates the opportunity to offer our suggestions for North Carolina’s Beneficiary Mitigation Plan for the Volkswagen, Audi, and Porsche Clean Air Act Settlement Funds, and looks forward to receiving North Carolina’s response on our comments. Caterpillar and its dealers are ready to accomplish these replacements and emission retrofits. We look forward to the opportunity to discuss these and more options with DEQ.

Sincerely,



Rey Agama
Global Regulatory Affairs Manager
Caterpillar Inc.

JRA:gl



December 29, 2017

Secretary Michael S. Regan
Assistant Secretary Sheila Holman
North Carolina Department of Environmental Quality
217 W. Jones Street
Raleigh, North Carolina 27603

RE: NGVAmerica Comments on the State of North Carolina Request for Information on the VW Environmental Mitigation Trust Project Ideas

Dear Secretary Regan and Assistant Secretary Holman:

Natural Gas Vehicles for America (NGVAmerica), the national trade association for the natural gas vehicle industry, respectfully submits the following comments in response to the State of North Carolina (NC) Department of Environmental Quality Request for Information (RFI) for the VW Environmental Mitigation Trust Project Ideas. These comments are in addition to the NGVAmerica comments submitted to you on April 17, 2017 (attached) regarding NGVAmerica's recommendations on how states can best use the Environmental Mitigation Trust (EMT or Trust) funds that each state will receive as part of the Volkswagen (VW) diesel emission settlement.

The VW EMT funds provide an extraordinary opportunity for North Carolina and other states to put significantly cleaner, lower-polluting vehicles on the road in public and private fleets. This funding (\$92 million) can and should be used by North Carolina to continue its commitment to accelerating the use of cleaner, alternative fuels that offer a cost-effective alternative to funding diesel vehicles.

The latest natural gas engines are the only zero emission equivalent or near-zero engines that are certified to perform at 0.02 g/bhp-hr of nitrogen oxide (NOx) emissions or better and should not be confused with diesel engines certified to the 2010 EPA standard of 0.2 g/bhp-hr NOx standard.¹ The 0.02 g/bhp-hr NOx standard requires that engines outperform the federal standard by 90 percent and is the cleanest heavy-duty engine standard today. It also is the lowest level currently recognized under California's Optional Low-NOx Standard

¹ See SCAQMD press release from June 3, 2016 providing details on the petition filed by state authorities urging the U.S. EPA to adopt the 0.02 NOx standard (<http://www.aqmd.gov/home/library/public-information/2016-news-archives/nox-petition-to-epa>) (*Today's action follows a March 4 vote by the SCAQMD's Governing Board to formally petition the U.S. EPA to adopt a so-called "near-zero" or "ultra-low" emissions standard for heavy-duty truck engines that is 90 percent cleaner than the current standard*).

(OLNS) for engine. Additionally, if renewable natural gas (RNG) is used, life cycle emissions from NGVs are reduced further.

NGVAmerica strongly encourages the NC Department of Environmental Quality to prioritize investments in natural gas near zero emission vehicles since these vehicles are now commercially available in all the desired vehicle categories stated in the Plan, and can begin improving North Carolina's air quality immediately at a much lower cost than other clean technologies (please refer to NGVAmerica's April 17, 2017 Comment Letter for additional information). Additional comments based on NGVAmerica research and analysis follow.

Current State Beneficiary Mitigation Plans

Sixteen 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).

Colorado's VW Plan goals are well-stated, and the Plan maximizes the deployment of current successful technologies to reduce NOx emissions for the lowest cost, and essentially creates equity among fuels for incentive funding. The stated goals of the CO Plan are those that NGVAmerica agrees with and are as follows:

- Maximize the trust's air quality benefits in Colorado (reduce NOx, GHG, other pollutants)
- Catalyze the adoption of zero emission and alternative fuel vehicles
- Distribute funds quickly (within 5 years) - emphasis is on ready projects and will be "first come, first served"
- Appropriately balance the cost of the project and emission reduction benefits
- Focus on but not limited to areas of non-attainment, location of VWs and environmental justice communities

The CO Plan funding details (vehicles are OEM only and require scrappage) are summarized as follows:

- \$18M Alt Fuel Trucks/School and Shuttle Buses (pages 12-14)
 - New diesel only allowed for fleets of 9 trucks or less
 - Government and public entities funded at about 40% of total vehicle cost with caps
 - Private funded at about 25% of total vehicle cost with caps
- \$18M Alt Fuel/EV Class 4-8 Transit Buses (pages 14-16)
 - VW funding to be combined with existing funds
 - Applicant per bus portion to be less than \$100,000
- \$12.2M Flex Funds to be used in response to market demand for eligible mitigation actions - to be spent after the initial allocations to other programs
- \$5M DERA option
- \$10.3M EV Chargers/infrastructure
- \$5.2M Administrative Costs

In allocating the funds above, Colorado did not pick a preferred fuel and kept the categories simple and broad. The \$18M for Alt Fuel Trucks/School and Shuttle Buses, CO 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 use the funds for a smaller number of vehicles (reducing less NOx) and there are other sources for EV funding).

Colorado has other funding they can apply to Transit, so they created a structure to augment the funding provided by the \$18M segment. The \$12.2M in Flex Funds is a good idea because these funds may be used to support projects in the segments that are successful and oversubscribed. For the DERA option, LNG drilling rig and hydraulic fracturing engines, mining trucks and locomotives are potential projects.

Additional Options for Vehicle Scrappage

NGVAmerica also recommends that the NC Department of Environmental Quality consider the following vehicle scrappage options in the Plan:

- Increase the options for scrappage beyond a strict replacement of a current fleet vehicle (allow another fleet to provide a vehicle for scrappage; purchase a vehicle for scrappage; etc.)
- 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

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 Version History.pdf](#) AFLEET Tool spreadsheet and user manual at: http://greet.es.anl.gov/afleet_tool and tool link is: <http://www.afdc.energy.gov/tools>

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** is the most current

NGVAmerica and its members are eager to serve as a resource to assist the North Carolina Department of Environmental Quality in its development of the state's proposed Beneficiary Mitigation Plan. We strongly encourage the state to recognize the unmatched role that natural gas vehicles can play in delivering NOx emissions reductions required by the settlement and 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 North Carolina. Please contact Jeff Clarke, NGVAmerica General Counsel & Director of Regulatory Affairs at 202.824.7364 or jclarke@NGVAmerica.org, or me at 303.883.5121 or smerrow@NGVAmerica.org to set up a meeting and for additional information.

Sincerely,

A handwritten signature in black ink, appearing to read 'D. Gage', with a long horizontal flourish extending to the right.

Daniel J. Gage

President, NGVAmerica