School Bus Related Comments

Gregory Poole
Bus Sales & Service

Submitted via email to daq.NC_VWGrants@ncdenr.gov

December 29, 2017

Brian C. Phillips, Mobile Sources Compliance Branch Supervisor
Phyllis D. Jones, Grants Administrator
NC VW Settlement RFI
Division of Air Quality – Mobile Sources
217 West Jones Street
1641 Mail Service Center
Raleigh, NC 27699-1641

Re: Using North Carolina's Volkswagen Settlement Funds for propane-fueled school buses

Dear Mr. Phillips and Ms. Jones,

The Environmental Mitigation Trust (EMT) presents North Carolina with the opportunity to reduce smog-forming nitrogen oxide ("NOx") emissions and to accelerate the clean-up of older, dirtier diesel buses, especially in communities that have been disproportionately burdened by these vehicles. As the Vice President for Gregory Poole Bus Sales and Service, I believe that propane school buses offer a cost-effective strategy to reduce NOx emissions and improve public health.

As a dealer responsible for supplying 100 districts with new buses, we find it a priority to minimize their exposure to avoidable toxins within the learning environment. These cleaner buses will significantly reduce our student's exposure to emissions that are associated with pre-2007 diesel buses, including increased asthma emergencies, bronchitis, and school absenteeism, especially among asthmatic children.[1]

Propane school buses effectively eliminate diesel particulate matter emissions that are associated with cancer and thousands of premature deaths nationwide every year. These vehicles are also a safe transportation solution because propane is non-toxic, non-carcinogenic and non-corrosive, and because their vehicle fuel tanks are 20 times more puncture-resistant than gasoline or diesel tanks.[2]

In addition, propane school buses are a smart investment for North Carolina because of the tremendous fiscal benefits they yield, including fuel cost reductions of 60 percent per gallon and operations and maintenance savings of $0.37 per mile, as compared to diesel.[3] We thus believe that propane school bus projects will provide the most comprehensive suite of benefits for our district and other districts across the state.

Propane is a proven and easy-to-integrate transportation solution, provides reduced operating costs for budget-constrained school districts, and drastically improves the quality of the air which our students breathe on a daily basis. We hope to support North Carolina's continued transition to a better air quality future with the purchase and deployment of propane buses and offer our

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[1] Adar, S. et al. "Adopting Clean Fuels and Technologies on School Buses. Pollution and Health Impacts in Children." ATS Journals, Volume 191, Issue 12. http://www.atsjournals.org/doi/abs/10.1164/rccm.201410-1924OC#.WA-HlNUrJhE, June 15, 2015.
[2] "Propane Autogas – Safe and Reliable." Blue Bird. https://www.blue-bird.com/blue-bird/Propane-is-safe.aspx.
[3] "Propane Testimonials." Blue Bird. http://www.blue-bird.com/blue-bird/propane-testimonials.aspx.

support as the planning process moves forward. Should you have any follow-up questions, please reach out to me at the contact information below.

Sincerely,

Paul Eberhart

Vice President Bus Sales and Service

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Section 1 - Project Applicant Information

- *Company/Agency/Organization Name:* Gregory Poole Bus Sales & Service
- *Contact Person Name:* Paul Eberhart
- *Government/Non-Government:* Non-Government
- *Mailing Address:* 4807 Beryl Road Raleigh, NC 27606
- *Phone Number:*919-890-4337
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Section 2 – VW Program and Solicitation Design Questions

(1) How should DEQ prioritize projects?

Projects should be reviewed based upon the opportunity to reduce NOx over the projects lifetime, in addition to the opportunity of the applicant to grow and sustain the program. The cost to achieve these pollutant reductions should be an important factor. These costs include not only the technologies capital cost, but also the other costs associated with the program proposed (fueling and maintenance infrastructure, training, certification, etc.).

(2) What is the anticipated demand for each eligible project type?

North Carolina ranks lowest in its percentage of alternative fuel use in school buses. We believe that with some assistance from the state, the misguided perception that alternative fuels are difficult and costly to implement could be overcome. The additional cost in North Carolina to go from a diesel school bus to the various alternatives is shown below.

Table 1: Breakdown of estimated average cost of school buses running on four different fuel types.

Total Buses Operating in State (# Units) Source: R. L. Polk	16,496
Est. Cost of 2019 Model Year Diesel Bus ($)	$83,500
Est. Cost of 2019 Model Year Propane Bus ($)	$92,400
Est. Cost of 2019 Model Year CNG Bus ($)	$113,500
Est. Cost of 2019 Model Year Electric Bus ($)	$350,000

As can be seen, the upcharge from diesel to propane is $8,900 currently. It is estimated, it would take the school district less than 2 years to break even. School districts using propane are saving $0.37/mile as compared to diesel, so districts could demonstrate a future financial benefit in addition to the environmental benefits discussed below.

Aside from the incremental cost to switch to an alternative, the aversion to change is the major obstacle to growing alternative fuel use in school bus fleets. Furthermore, the vast majority of school districts that buy propane school buses are repeat buyers. In fact, Blue Birds sales of alternative fuels exceeds 30% of annual production. Most states across America have seen a tipping point in alternative fuel use once a handful of districts make the switch and document savings and ease of implementation. We believe that with the $47 million investment, DEQ could help achieve that tipping point in North Carolina.

North Carolina operates over 16,000 school buses. If DEQ invested half of its allocation to an alternative fuel school bus program, over 12% of the total state fleet could be replaced with near-zero emissions school buses.

Table 2: Potential Program Impacts if DEQ invested half of the VW funding in a Clean School Bus program. Scenario includes replacement of a 2007 model year diesel with a 2019 model year Propane Vision with low NOx certification.

50% Funding Scenario	
Assumptions: 2,049 school buses replaced, 2007 average model year replaced with 2019 model year Vision propane bus, 15 year service life, 16,500 miles per year	**POTENTIAL IMPACT**
# of Propane School Bus Replacements	2,049
% of Total NC Bus Fleet Replaced	12.42%
Total Funding Proposed: Half of NC VW Allocation ($)	$47,339,357
Total NOx Reduction (lbs)	1,441,209
Petroleum Reduction (gallons)	65,871,090

(3) The percentage of trust funds, if any, that DEQ should devote to Light Duty Zero Emission Vehicle Supply Equipment?

Of all the mobile source emissions in North Carolina, on-road light-duty gasoline vehicles contribute 42% of the NOx emissions to the state's inventory. Thus, we support taking advantage of the maximum 15% allocation for Light Duty Zero Emission Vehicle Supply Equipment in order to mitigate these emissions.

(4) What is the anticipated demand for specific types of diesel emission reduction projects not eligible under the VW settlement but otherwise eligible under DERA or other state programs?

We cannot speak to the demand for various eligible project types, under DERA or otherwise.

(5) Should a certain percentage of available VW funds be allocated to each eligible project type and if so how should the percentage be determined?

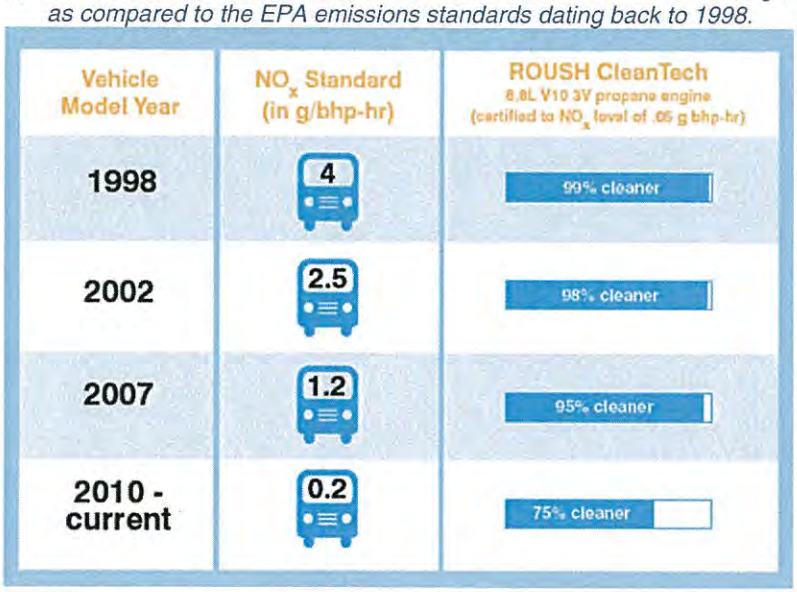
We appreciate that North Carolina has a suite of options form which to choose. However, to most efficiently and effectively distribute these funds, we recommend that the state allocate at least 50% of its funds for school buses. To do so, North Carolina can take advantage of ready-made grant programs, such as DERA's Clean School Bus Rebate Program, that will reduce the state's administrative burden and ultimately lead to greater cost-effectiveness in terms of NOx reductions statewide.

Specifically, propane-fueled school buses exist today that are much cleaner than even the cleanest diesel school buses. In fact, Blue Bird and ROUSH CleanTech's model year 2017 propane school buses recently received its California Air Resources Board certification at 0.05 grams NOx per brake horsepower-hour (g/bhp-hr).[4] This new propane engine is 75 percent cleaner than today's cleanest diesel engines that are compliant with the model year 2010 standard

[4] "Executive Order A-344-0074". California Environmental Protection Agency, Air Resources Board, May 15, 2017. https://www.arb.ca.gov/msprog/onroad/cert/mdehdehdv/2017/roush_hdoe_a3440074_6d8_0d05_lpg.pdf.

of 0.2 g NOx / bhp-hr. What's more, our new propane buses will be 99 percent cleaner than the oldest, pre-2007 model year buses still operating in many school districts today.[5]

Figure 2: Nitrogen Oxide Standard for the Roush CleanTech low NOx engine as compared to the EPA emissions standards dating back to 1998.



(6) Should a certain percentage of available Mitigation Trust funds be reserved for government projects?

Yes, we recommend that North Carolina prioritize the replacement publicly-owned diesel vehicles.

(7) Should funds be geographically distributed, and if so how?

While we recognize the benefits of targeting projects in specific counties, we also urge the state recognize the benefits of funding projects that directly benefit sensitive populations, such as school buses that transport thousands of students daily across North Carolina.

Propane school buses in particular significantly reduce children's exposure to emissions that are associated with pre-2007 diesel buses, including increased asthma emergencies, bronchitis, and school absenteeism, especially among asthmatic children.[6] Propane school buses also effectively eliminate diesel particulate matter emissions that are associated with cancer and thousands of premature deaths nationwide every year. These vehicles are also a safe transportation solution because propane is non-toxic, non-carcinogenic and non-corrosive, and because their vehicle fuel tanks are 20 times more puncture-resistant than gasoline or diesel tanks.[7]

(8) Should governmental entities be required to provide matching funds and if so, how much?

We find that funding projects at 100% will limit the potential NOx reductions that North Carolina may fund. Additionally, school district commitment to a long-term, thoughtful and sustainable

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[5] For model year 1998 to 2003 diesel engines, EPA established a NOx emission standard of 4.0 g NOx / bhp-hr. Please refer to EPA's summary table of diesel engine exhaust emission standards for further detail.

[6] Adar, S. et al. "Adopting Clean Fuels and Technologies on School Buses. Pollution and Health Impacts in Children." ATS Journals, Volume 191, Issue 12. http://www.atsjournals.org/doi/abs/10.1164/rccm.201410-1924OC#.WA-HINUrJhE, June 15, 2015.

[7] "Propane Autogas – Safe and Reliable." Blue Bird. https://www.blue-bird.com/blue-bird/Propane-is-safe.aspx.

program diminishes as funding percentages increase from our experience. We thus recommend that the state limit its funding for governmental entities to a maximum of 50% of the total vehicle costs to improve cost-effectiveness and spread the state's dollars further.

Propane school buses save districts over $2,500 per year per bus in fuel and maintenance savings (national average). Also, infrastructure rarely cost a school district or the state upfront. No maintenance facility upgrades are required either. Once the initial aversion to change through a lower capital cost is achieved, the district typically sees the other benefits within one year of operation. Therefore, once the aversion to change is overcome with a capital cost that is more attractive than the used school bus market, districts will likely see the benefit of an alternative fuel fleet.

(9) Should DEQ establish a minimum project size and if so, what size?

We recommend that North Carolina allow the applicants to propose budgets without the constrains of a minimum project size. This will allow applicants from rural locations, who may only have one or two vehicle fleets, to participate in the funding programs.

(10) In addition to evaluating a proposed project's total cost effectiveness ($/ton), what other key factors should DEQ consider when evaluating projects?

We recommend that North Carolina provide bonus points or some other form of preferential treatment in the application process for vehicles equipped with low NOx engines. As evidence of this, we used the 2016 version of AFLEET, developed by Argonne National Laboratory, to model NOx reductions and cost effectiveness. Our analysis compares the replacement of a model year 2007 diesel school bus with a new diesel, propane, CNG or electric school buses. It is clear that propane is the most cost-effective option at reducing NOx emissions.

Table 3: Propane school buses are shown to be 32% more cost-effective vs diesel.

Standard Argonne AFLEET Emissions Outputs				
Fuel	Purchase Price	NOx Reduced	$/lb	Cost Effectiveness vs. Propane
Propane	$ 92,400	703.3	$ 131	
Diesel	$ 83,500	432.8	$ 193	-32%
Electric	$ 350,000	777.0	$ 450	-71%
CNG	$ 113,500	678.7	$ 167	-21%

(11) What other feedback do you have on project evaluation and/or scoring criteria?

North Carolina should create funding programs that allow all fuel types to compete. However, the state should select projects based on the most cost-effective use of funds in terms of NOx reductions and the proposed project's benefits to areas disproportionately burdened by diesel pollution. We also appreciate consideration of factors described in our response to question 1.

(12) What publicly available tool(s) should be used to quantify anticipated emission reductions/offsets for eligible mitigation projects? What, if any, additional resources should be provided and made available?

We used the 2016 version of Argonne's AFLEET tool to calculate anticipated emissions reductions as well as cost effectiveness (as shown in Table 3 above). Unfortunately, EPA's DEQ and GREET do not account for some of the new alternative fuel school bus technology, such as

the low NOx propane school buses (.05 g/bhp-hr) we are currently purchasing and the near-zero emissions propane school buses that will available from Blue Bird next year (.02 g/bhp-hr).

(13) What methods could DEQ employ to reduce barriers and increase participation in future solicitations for projects?

We commend the state on its transparent process thus far and we encourage the state to continue these measures. We have found that this is the best way to reduce barriers and increase participation.

(14) What information/resources would be most valuable for stakeholders interested in submitting projects and what is the best way to communicate those?

Gregory Poole Bus Sales would like to be added to the mail list for any future meetings or discussion groups.

Section 3 – Submitting Your Project Information

Applicable Eligible Mitigation Project Category: 2. Class 4-8 School, Shuttle, or Transit Buses with model year 2009 or older engines and a GVWR greater than 14,001 lbs. and used for transporting people.

Project Summary:

- *Geographic area:* State of NC
- *Fleet type:* School buses
- *Mitigation action:* Vehicle replacement with new vehicles equipped with low NOx engines
- *Number of vehicles:* Over 2,000 school buses
- *Emission reduction/offset technology to be used:* Propane-fueled low NOx engines certified to 0.02 g/bhp-hr
- *Estimated cost of project:* $47.3 million
- *A description of the expected overall benefits of the proposed mitigation activity, including a description of how the proposed project mitigates the impacts of nitrogen oxides (NOx) emissions:*

50% Funding Scenario	
Assumptions: 2,049 school buses replaced, 2007 average model year replaced with 2019 model year Vision propane bus, 15 year service life, 16,500 miles per year	**POTENTIAL IMPACT**
# of Propane School Bus Replacements	2,049
% of Total NC Bus Fleet Replaced	12.42%
Total Funding Proposed: Half of NC VW Allocation ($)	$47,339,357
Total NOx Reduction (lbs)	1,441,209
Petroleum Reduction (gallons)	65,871,090

Project Detail:

- *Number of vehicles:* Over 2,000 School Buses
- *Class or equipment type:* School Bus
- *Engine make, engine model, engine model year, current tier level or emission standards:*
- *Fuel type, amount of fuel used, annual miles travelled or annual usage rate, annual idling hours:* Assumption is replacing a 2007 MY Cummins diesel 6.7L with a MY 2018 or 2019 propane school bus with a low NOx 6.8L V10 propane engine (.05 or .02 g bhp-hr). 15,000 miles per year. 15 year service life. 180 idle hours.

How should determination be made on whether a proposed project will benefit areas that have been disproportionately impacted by emissions of nitrogen oxides (NOx) or other pollutants?
As discussed above, we urge the state recognize the benefits of funding projects that directly benefit sensitive populations, such as school buses that transport thousands of students daily across North Carolina.

Propane school buses significantly reduce children's exposure to emissions that are associated with pre-2007 diesel buses, including increased asthma emergencies, bronchitis, and school absenteeism, especially among asthmatic children. Propane school buses also effectively eliminate diesel particulate matter emissions that are associated with cancer and thousands of premature deaths nationwide every year. These vehicles are also a safe transportation solution because propane is non-toxic, non-carcinogenic and non-corrosive, and because their vehicle fuel tanks are 20 times more puncture-resistant than gasoline or diesel tanks.

Capital and Project Costs:

- Calculate and provide projected capital cost ($/unit) and total project cost. Note calculations for proposed LD ZEV projects should include operation and maintenances cost, and calculations for eligible all-electric mitigation actions should include charging infrastructure cost (where applicable); and

A 2018 model year propane bus is expected to cost approximately $92,000.

- Identify projected cost share and, if applicable, what additional sources of funds may be utilized as matching funds.

  The North Carolina Propane Education & Research Council has pledged $1,000 toward each new propane school bus delivered to North Carolina for the first 10 buses.

We propose DEQ use 50% of its funding for a Clean School Bus program. A 25% rebate would be applied per school bus, with 75% matching funds. The 25% rebate depending on the type of fuel would more than cover incremental costs, scrappage and residual value lost in scrapped vehicle. Estimated number of replacements based on fuel type are below.

50% Funding Scenario / 25% Rebate Scenario	TOTAL
Total Buses Operating in State (# Units)	16,496
Est. Cost of 2019 Model Year Diesel Bus ($)	$83,500
Est. Cost of 2019 Model Year Propane Bus ($)	$92,400
Est. Cost of 2019 Model Year CNG Bus ($)	$113,500
Est. Cost of 2019 Model Year Electric Bus ($)	$350,000
Clean School Bus Incentive (% of bus cost)	25%

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Total North Carolina VW EMT Allocation ($)	$94,678,714
School Bus, One-Half Funding Allocation Scenario ($)	$47,339,357
Propane Bus Incentive ($), Based on 25% of Total Bus Cost	$23,100
CNG Bus Incentive ($), Based on 25% of Total Bus Cost	$28,375
Electric Bus Incentive ($), Based on 25% of Total Bus Cost	$87,500
Number of Estimated Bus Replacements, Propane Scenario	2,049
Number of Estimated Bus Replacements, CNG Scenario	1,668
Number of Estimated Bus Replacements, Electric Scenario	541
% of pre-2009 bus fleet, propane scenario	12.42%
% of pre-2009 bus fleet, CNG scenario	10.11%
% of pre-2009 bus fleet, electric scenario	3.28%

Expected Proposed Project Benefits:

- Calculate and provide the expected annual and lifetime project emissions reductions/offsets for NOx.

See below.

- Calculate and provide capital cost effectiveness ($/short ton of NOx reduced for each unit) and total cost effectiveness ($/short ton of NOx reduced for the entire project).

See below.

Using the 2016 version of AFLEET, propane school buses are expected to reduce 703 pounds or .35 tons of NOx per unit. Assumptions were based on a 15-year life cycle and 16,500 miles per year. Cost effectiveness is shown below for school buses fueled by the four main fuel types commercially available.

Figure 3: Propane school buses are expected to reduce 703 pounds

Standard Argonne AFLEET Emissions Outputs				
Fuel	Purchase Price	NOx Reduced	$/lb	Cost Effectiveness vs. Propane
Propane	$ 92,400	703.3	$ 131	
Diesel	$ 83,500	432.8	$ 193	-32%
Electric	$ 350,000	777.0	$ 450	-71%
CNG	$ 113,500	678.7	$ 167	-21%

In closing, Gregory Poole Bus Sales would like the opportunity to schedule a meeting with you to further discuss our proposal. Thank you for your time and consideration.

Regards,
Paul Eberhart
Gregory Poole Bus Sales

December 30, 2017

Agility Fuel Solutions, Powertrain Systems

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Reference: North Carolina Department of Environmental Quality RFI

Agility Fuel Solutions operates in six countries providing alternative fuel vehicle solutions; fuel storage solutions, engine solutions, fuel system solutions and much more. Supporting fleet customers and vehicle OEM's, Agility Fuel Solutions delivers CNG, LNG, Hydrogen, LPG (propane) & Hybrid Electric products. Our more than 200,000 sq. ft. state of the art manufacturing facility in Salisbury, NC is just one example of our commitment to manufacturing quality products. For more information please visit our website at http://www.agilityfuelsolutions.com.

Our comments below:

1. Prioritizing projects
    - School buses are an important segment to make a priority
        - Our children ride these buses for 12 years
        - Replacing the diesel engine with an LPG engine repower package would provide years of operation using an environmentally cleaner, quieter and more reliable product in comparison to the diesel engine
        - Running a clean LPG engine provides many social, economic and environmental benefits
            - All required vendors are located in North Carolina which brings jobs and prosperity to the State
            - Lower cost fuel, lower operating cost per mile driven
            - Lower maintenance costs

- Cleaner burning fuel

2. Anticipated demand for an eligible project
    - A repower of one of the older diesel engines could be a large demand due to a number of factors.
        - Inherent mechanical problems require engine replacement long before the expected life expectancy of the vehicle.
        - There are > 11,000 school buses using this engine and every shop has had trouble.
        - In North Carolina this engine is currently used in ~1,000 school buses that could all be easily converted to operate on clean burning LPG using proven OEM products. Replacing diesel engines would enable North Carolina to meet the goal of the VW mitigation trust.
3. Should DEQ devote funds to Light Duty Zero Emission Vehicle supply equipment?
    - All clean air plans should include support of all forms of clean power vehicles.
    - The key to successful deployment that achieves desired near and long-term results is to assess and balance the overall cost of implementation and emission reduction benefit across the fleet
    - Near term, the total cost of zero emission vehicle deployment is quite high resulting in displacing fewer diesel vehicles per dollar invested when compared to near zero clean fuel vehicles. So, while funds should be devoted to zero emission vehicles, successful growth of a clean fuel vehicle market requires balanced seeding and support. The VW settlement provides the opportunity for developing the foundation for clean fuel vehicles by also promoting abundant domestic produced energy.
4. What is the anticipated demand for specific types of diesel emission reduction projects not eligible under the VW settlement but otherwise eligible under DERA or other state programs?
    - The demand for clean diesel emission reduction projects is high.
    - The challenge remains though that diesel emission reduction technology continues to add significant cost to the engine and exhaust after treatment including the inconvenience of adding DEF to a separate tank.
    - Where the VT365 engine has a diesel particulate filter, regeneration has performed poorly due to the duty cycle of a school bus and many larger school districts have purchased expensive equipment to clean these filters, taking more maintenance time as well.
    - Put as much or more funding into engine combustion efficiencies/technology as exhaust after treatment for diesel.
5. Should a certain percentage of available VW funds be allocated to each project type and if so how should the percentages be determined?
    - Yes, VW funds should be allocated to numerous project types. A balanced approach to advance all forms of clean fuel vehicles near term should be employed. The percentages should be determined based on emission reduction impact. Maximizing the number of aged diesel vehicles that are replaced with low emission vehicles thus growing the overall clean fuel vehicle fleet in the State is also a good measure.
6. Should a certain percentage of available Mitigation Trust funds be reserved for government projects?

- At least 50% should be reserved for school buses alone. Our future scholars are riding a school bus and this needs to have a major priority.

7. Should funds be geographically distributed and if so, how?
    - By the most populated or polluted cities/counties first.
8. Should governmental entities be required to provide matching funds and if so, how much?
    - To be eligible for funds from the VW settlement, matching funds shouldn't be required.
9. Should DEQ establish a minimum project size and if so, what size?
    - Yes, creating critical mass of clean fuel vehicles and attracting the sustained interest of innovative companies and individuals requires a fair and balanced approach of funding sizable projects that can then grow into self-sustaining clean air vehicle market segments
10. In addition to evaluating a proposed project's total cost effectiveness ($/ton), what other key factors should DEQ consider when evaluating projects?
    - Start to finish timing of implementation and benefit.
      Life cycle vehicle cost and benefit to the consumer
    - The number of diesel vehicles/engines removed from service.
    - Projected fleet operating cost reductions.
11. What other feedback do you have on project evaluation and/or scoring criteria?
    - Where engines are removed from service a way to track and confirm they are destroyed so there's no chance for anyone to rebuild or re-cycle for profit.
    - Leverage this funding opportunity to make it mandatory that fleets in the State acquire a certain percentage of clean fuel vehicles.
12. What public available tools should be used to quantify anticipated emissions reductions/offsets for eligible mitigation projects? What, if any, additional resources should be provided and made available?
    - In North Carolina, the EPA has emissions testing capabilities and could offer some testing support.
    - PEMS, portable emissions measurement system, is light weight and effective to measure the emissions. Available to the public from a number of suppliers.
    - The project could also include the costs of this equipment but also could be shared in a geographic area.
    - The need to confirm effectiveness of the project is crucial.
13. What methods could DEQ employ to reduce barriers and increase participation in future solicitations for projects?
    - Invest in education and awareness programs promoting the benefits and attributes of clean air vehicles.
    - Identifying where and what is emitting the most emissions and providing attractive solutions. Technology will catch up but not without the pressure of regulations and the first adopters to implementation.
    - Operating cost is always the bottom line influence, so providing real life examples of how to reduce emissions.
    - Provide incentive programs direct to end users that promote the acquisition on clean air vehicles

- Keeping up with technology and the DEQ can announce new technologies that are coming before the public actually hears about it. Providing funding channels to help attract participation.

14. What information/resources would be most valuable for stakeholders interested in submitting projects and what is the best way to communicate those?
    - Publish the State vision, priorities and timing plans to increase the number of clean fuel vehicles on the road
    - Training workshops. Go direct to the interested/proposed stakeholders to encourage participation by providing information and direction.

As a supplier of alternative fuel solutions, Agility Fuel Solutions is and has been supporting the growth and technology for more than 20 years. We will submit a school bus repower project that will reduce NOx emissions from a diesel engine popular in school buses prior to 2007. Our data shows that reductions could be as much as 200% reduction.

We appreciate the opportunity to provide this information and the continued participation with NC DEQ.

Best regards

Wayne Moore
Programs Mgr.
Agility Fuel Solutions

Section 1 - Project Applicant Information

- Company/Agency/Organization Name
  The Wake County Public School System

- Contact Person Name
  Doug Thilman

- Government/Non-Government
  Government

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- Phone Number
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- Email Address
  dthilman@wcpss.net

Section 2 – VW Program and Solicitation Design Questions

Respondents should consider providing information in response to the following questions:

1. How should DEQ prioritize projects?
   Priority should be given to those projects that provide the most significant reduction, overtime, of the harmful emissions from diesel engines.

2. What is the anticipated demand for each eligible project type?
   There is substantial and continuous demand for yellow school buses. In Wake County, the average school bus travels +/- 19,500 miles per year. We are the largest transit provider in Wake County. Our buses travel nearly 16,000,000 miles per school year.

3. The percentage of trust funds, if any, that DEQ should devote to Light Duty Zero Emission Vehicle Supply Equipment?
   A portion of the trust funds should be dedicated to Light Duty Zero Emission Vehicle Supply. These Vehicles are a major contributor to regionally based emission problems. The light duty fleet, while often a Lower capital cost, with the ease of use makes the vehicle popular to run with little to no regard for Emission standards.

4. What is the anticipated demand for specific types of diesel emission reduction projects not eligible under the VW settlement but otherwise eligible under DERA or other state programs?
   This information is not available at this time. We would expect to work with DEQ on answering this question.

5. Should a certain percentage of available VW funds be allocated to each eligible project type and if so how should the percentage be determined?
   VW Funds should be distributed to those projects that have the most impact on emission reduction, but also those that project sustainability over time. These two factors should carry a significant weight in determining which projects should receive funding.

6. Should a certain percentage of available Mitigation Trust funds be reserved for government projects?
   In the larger urban areas a significant portion of fossil fuel emissions comes from government owned vehicles. An additional weight should be added for government projects that contain large fleet reduction proposals to include a move to lower emission, alternative fuel or electric fleets. Yes, yellow school buses are, by far, the largest transit provider in North Carolina. School buses transport young people to and from school over 180 days per year. School buses make numerous stops and traverse through most of the communities that they service. Wake County Public Schools transport approximately 75,000 students on yellow school buses daily.

7. Should funds be geographically distributed, and if so how?
   Funds should be distributed geographically, based on need for a reduction in emissions within that particular region. If there is a specific region that has a more disparate need for such a reduction and the project contained within can show a positive impact then geography can be used as a determinant for funding. Large school districts would likely be best positioned to maintain and operate electric school buses given economies of scale and the number and types of trips that are provided.

8. Should governmental entities be required to provide matching funds and if so, how much?
   No. In most cases such capital outlays are not available to local government agencies. These funds should be reserved for projects that are built to have a significant impact but do not require the agency to pull funding from other sources in order to do so. The VW Settlement Funds can be used for large capital outlays that also include infrastructure. Therefore the projects that are funded should be complete. However, the funds should not be allocated for the maintenance of the project over time. Agencies should demonstrate the long term plan for such maintenance of the project.

9. Should DEQ establish a minimum project size and if so, what size?
   Any project that demonstrates the reduction of fuel emissions and shows a positive environmental impact on the community within should be considered regardless of the size. Larger projects would likely generate more reliable data and useful data on the performance of electric school buses.

10. In addition to evaluating a proposed project's total cost effectiveness ($/ton), what other key factors should DEQ consider when evaluating projects?
    Cost, safety, PR Plan, Education plan for those impacted by the project. The DEQ should consider projects that have the most potential for long-term benefits. For example, this funding could be used to substantially advance or be a catalyst for "clean" transportation for the state's school age population.

11. What other feedback do you have on project evaluation and/or scoring criteria?
    The evaluation and scoring of each project should be independent of other projects. The team scoring should include industry experts as well as concerned citizens who demonstrate a working knowledge of how such projects may impact the local or regional community.

12. What publicly available tool(s) should be used to quantify anticipated emission reductions/offsets for eligible mitigation projects? What, if any, additional resources should be provided and made available?
    The DEQ in cooperation with Wake County Public Schools could establish a web or mobile computer application (app) that allows schools to track the reduction in "pollution" using electric school buses. This data could be incorporated into science classes to evaluate effectiveness.

13. What methods could DEQ employ to reduce barriers and increase participation in future solicitations for projects?
    Ease of application is the most important factor for agencies to see in terms of participation in such projects.

14. What information/resources would be most valuable for stakeholders interested in submitting projects and what is the best way to communicate those?
    Information must be easily accessible via the web and contained in a manner that allows for easy download. It should also include relevant links that provide more detailed information. This should include links that demonstrate a novice level as well as expert level of detail. The ease of navigation of such information is critical to applicant's engagement with the process.

Section 3 – Submitting Your Project Information
Identify Applicable Eligible Mitigation Project Category:

1. Class 8 Local Freight Trucks and Port Drayage Trucks with 1992-2009 model year engines and a Gross Vehicle Weight Rating (GVWR) greater than 33,000 pounds (lbs.)

2. **Class 4-8 School, Shuttle, or Transit Buses with model year 2009 or older engines and a GVWR greater than 14,001 lbs. and used for transporting people.**

3. Class 4-7 Local Freight Trucks with 1992-2009 model year engines and a GVWR between 14,001 and 33,000 lbs.
4. Freight Switchers with pre-tier 4 engines and operating more than 1,000 hours per year.

5. Ferries/Tugs with unregulated Tier 1 - Tier 2 marine engines.

6. Ocean-Going Vessels Shorepower.

7. Airport Ground-Support Equipment with Tier 0 - Tier 2 diesel engines, and uncertified or certified to 3 grams per brake horsepower-hour spark ignition engines.

8. Forklifts with greater than 8,000 lbs. lift capacity and/or Port Cargo Handling Equipment.

9. Light Duty (LD) zero emission vehicle (ZEV) Supply Equipment (Level 1, Level 2, or fast charging equipment) and hydrogen fuel dispensing equipment.

Project Summary:
Briefly describe the proposed project, including:
1. Geographic area where vehicles/vessels/engines are operated (e.g., city/cities, county/counties, and/or neighborhoods);
   The Wake County Public School System is located in central North Carolina. Home to the Capital City, Raleigh. Wake County encompasses over 800 square miles and has a population of just over 1 million people. There are both urban and rural parts to the county. The number of drivers on Wake County roads has increased significantly since 1990, and by the end of 2007, nearly 706,000 vehicles were registered in the county.

One of the main sources of emissions is people commuting to and from work. As the population increases, more people need to commute to and from work. Although a number of transportation modes exist, such as driving, carpooling, public transportation, biking and walking, the most common choice for commuting to work is driving alone. This tendency has increased over time.

2. Fleet type (e.g., ports, airports, marine, school buses);
   This proposal is action upon the school bus fleet operated in Wake County by the Wake County Public School System. This is a fleet of 800 yellow diesel powered school buses and over 75 diesel powered activity buses. This fleet travels ***approximately 100,000*** *miles each day on the roads of Wake County transporting 75,000 students to and from school. In addition there are numerous runs and school activities that require diesel power buses for transportation. This includes field trips, athletics events and other school activities.*

3. Mitigation action (e.g., engine repower, vehicle replacement, deployment of LD ZEV supply equipment/Shorepower systems);
   The action proposed is to set a replacement schedule of full electric buses for the aging fleet of diesel powered engines.

4. Number of engines/vehicles/vessels/equipment targeted for emission reductions;
   The plan may include a replacement schedule of 10(or more) buses per year for the next 5 years. This includes the purchase of all electric buses and the necessary charging equipment as well as other infrastructure items necessary for the complete conversion. The number of buses could increase over time if acquisition costs decrease while efficiency increases.

5. Emission reduction/offset technology to be used;
   Electric school buses would likely be most beneficial in achieving the goals of the settlement.

6. Estimated cost of project; and
   The cost would be dependent on the type and number of buses that would be replaced. It is expected that the cost for an electric school bus will decrease over time.

7. A description of the expected overall benefits of the proposed mitigation activity, including a description of how the proposed project mitigates the impacts of nitrogen oxides (NO_x) emissions.
   Each electric school bus would remove a diesel school bus that travels, on average, +/- 19,500 per year. We would need to work with technical staff at DEQ to assist with calculating the likely reduction in nitrogen oxides (NO_x) emissions.

Project Detail:

1. Provide information on specific engines/vehicles/vessels/equipment targeted for emission reductions, including (where applicable):
   a. Number of vehicles, class or equipment type, engine make, engine model, engine model year, current tier level or emission standards, fuel type, amount of fuel used, annual miles travelled or annual usage rate, annual idling hours.

   This information is not available at this time. We would expect to work with DEQ on answering this question.

2. Provide information on the new eligible verified and/or certified diesel emission reduction technology(s) to be implemented under the proposed project, including (where applicable):
    a. technology type, make, and model, engine model year, horsepower, tier level or emission standards, fuel type and annual idling hours reduced.

   This information is not currently available.

3. Provide information on LD ZEV supply equipment (electric or hydrogen), including (where applicable): number, equipment type (Level 1/2/fast chargers or hydrogen dispensing), and location (public place, workplace, or multi-unit dwelling).
   These types of facilities would likely be located at our existing and future bus maintenance facilities. We are currently in the early design stages of a new regional bus maintenance facility that would substantially benefit from this settlement.

4. How should determination be made on whether a proposed project will benefit areas that have been disproportionately impacted by emissions of nitrogen oxides (NOx) or other pollutants?
    a. Whether a project applicant is low income, minority, or disadvantaged or operates vehicles in these communities. Benefits to areas that have been disproportionately impacted by NOx and other pollutants.
       Wake Count Public Schools transports all students that are eligible. A substantial portion of riders are low income, minority, or disadvantaged. Reducing emission will be beneficial to these and all students within the school system.

Capital and Project Costs:

1. Calculate and provide projected capital cost ($/unit) and total project cost. Note calculations for proposed LD ZEV projects should include operation and maintenances cost, and calculations for eligible all-electric mitigation actions should include charging infrastructure cost (where applicable); and
   This information is not available at this time. We would expect to work with DEQ on answering this question.

2. Identify projected cost share and, if applicable, what additional sources of funds may be utilized as matching funds.
   We would to work with the Wake County, the Department of Public Instruction (DPI), and DEQ on responding to this question.

Expected Proposed Project Benefits:

1. Calculate and provide the expected annual and lifetime project emissions reductions/offsets for NO_x.
   This information is not available at this time. We would expect to work with DEQ on answering this question.

2. Calculate and provide capital cost effectiveness ($/short ton of NO_x reduced for each unit) and total cost effectiveness ($/short ton of NO_x reduced for the entire project).
   This information is not available at this time. We would expect to work with DEQ on answering this question.

VOLKSWAGEN SETTLEMENT FUND USAGE AND PROJECT PRIORITIZATION

A Plan for Early Replacement of School Buses in North Carolina to Reduce Emissions and Reduce State General Funds Needed for School Bus Replacement

Submitted on Behalf of:

NORTH CAROLINA STATE BOARD OF EDUCATION
CHAIRMAN BILL COBEY

NORTH CAROLINA DEPARTMENT OF PUBLIC INSTRUCTION

EXECUTIVE SUMMARY

School buses in North Carolina are replaced using funds from a legislative appropriation for that specific purpose. Criteria are set according to G.S. 115C-249, which makes most school buses eligible for replacement at 250,000 miles or 20 years of age.

In general, diesel-powered school buses can reach those numbers even though the start-stop duty cycle is hard on them. However, in the past 10 years, certain models of school buses have proven to be disproportionately costly to operate and maintain. Buses made by IC Bus with VT365 engines have lower fuel economy and higher emissions than modern vehicles and they require engine replacements much more frequently than their peers; some as frequently as every 60,000-100,000 miles.

It is our contention that DEQ and the General Assembly should consider more than just the cost-per-ton of emissions reduced by a project. While that is a laudable overall goal, localized diesel emissions can disproportionately impact the local environment and the health of vulnerable populations, such as children. That situation is no more acute than inside a school bus or around the school property where there is a high concentration of children as well as vehicles. Other key factors should also be considered such as reductions in outlays from the General Fund and the ability to garner positive media attention to publicize the use of the VW funds.

Using a mix of modern diesel vehicles with vastly improved emissions profiles and increased fuel economy, in combination with forward-looking implementations or pilots of modern alternative fuel vehicles, the State Board of Education recommends that North Carolina join the voices of other states, such as South Carolina, Utah, and Arizona, which are looking to use large amounts of VW funds to modernize and reduce emissions from the iconic yellow school bus fleet.

I. PROJECT APPLICANT INFORMATION

Agency: State Board of Education / Department of Public Instruction
Contact Person: Kevin Harrison, Section Chief, Transportation Services
Government
Mailing Address: 6319 Mail Service Center, Raleigh NC, 27699-6319
Phone Number: 919-807-3579
Email Address: Kevin.Harrison@dpi.nc.gov

II. VW PROGRAM AND SOLICITATION DESIGN QUESTIONS

How should DEQ prioritize projects?

This settlement fund exists because Volkswagen circumvented environmental regulations on their vehicles; therefore, it is logical that these funds primarily be focused on addressing mobile source emissions from vehicles.

Projects should be prioritized based on their capacity to not only reduce vehicle emissions and fuel consumption, but also to increase highway safety.

Further, projects should be prioritized based on past performance with the entity, and that organization's ability to execute and implement emissions reduction projects quickly so that the benefits can be realized as soon as possible.

In addition to evaluating a proposed project's total cost effectiveness ($/ton), what other key factors should DEQ consider when evaluating projects?

Cost effectiveness of the environmental benefits is a very important consideration. That said, $/ton is not the only way to view improvements to the environment. Localized emissions benefits can create a far more powerful benefit to the health and wellness of our children than a reduction in overall emissions spread over large areas or in areas with little population. Thus, DPI suggests that DEQ also factor in whether the projects will improve the local environment significantly and whether those emissions improvements will significantly improve the health and wellbeing of vulnerable populations.

DEQ should also consider whether the project will have other monetary benefits to the State of North Carolina, such as reductions in General Fund expenditures and lower cost of operation for government entities. These benefits allow the VW money to serve the purpose of reducing emissions while also reducing the cost of government operations.

Another key consideration should be the project's visibility and ability to garner media attention. Ideal projects should be able to quickly and effectively raise the public's perception and draw attention to how settlement funds are being used in a positive way. The most effective projects should have visible and tangible deliverables that are easy to showcase to the general public.

Finally, where a project involves government services, the project should raise the profile of those services with a goal of increased utilization and long-term benefits. If increased utilization of the government service would have positive environmental and economic benefits to the state, then those potential benefits should also be considered.

III. Mitigation Project Details

a. Applicable Project Category and Project Summary

The State Board of Education and Department of Public Instruction are putting forth a project to replace Class 7 Type-C School Buses, with 2006 model year and older engines.

The project would involve the early replacement of around 815 school buses currently powered by the Navistar International VT365 engine. These vehicles travel approximately 10 million miles per year collectively.

The replacement vehicles would largely be new diesel-powered school buses, with some propane-powered school buses, as well as pilots of fully electric school buses and the associated charging infrastructure.

Geographically the vehicles are widely distributed throughout the state and are running in cities, counties, neighborhoods, highways, and around schools.

The overall project costs are estimated to be 3-4 million dollars for 10 fully electric school buses and associated infrastructure, and 75 million dollars for a mix of new diesel and propane school buses.

b. IMPACT OF CONTINUED OPERATION OF THE VT365 ENGINE:

i. Comparative per mile cost of parts and services only

TABLE 1 – Non-Tire Parts and External Services Costs per Mile by Engine and Model Year (07/14-06/16)

Model Year	CAT 3116/3126 (Caterpillar)	MBE 900 (Mercedes)	ISB 6.7L (Cummins)	T444E (Navistar Int)	VT365 (Navistar Int)
2001	$0.16				
2002	$0.20				
2003	$0.20			$0.37	
2004				$0.27	
2005		$0.17			
2006		$0.21			$0.41
2007		$0.21			$0.41
2008		$0.19			$0.39
2009			$0.19		
2010			$0.16		

The period examined was July 2014 through June 2016. The costs listed above include average parts, outsourced services costs per mile (not including fuel and tires). Tires are largely replaced at the same rate regardless of the engine make, and fuel efficiency and labor costs are addressed in separate sections below.

Since North Carolina school buses have a 5 year warranty, model years 2011 and newer were under warranty during at least part of the period examined and as such are not reliable data points.

The VT365 generally appears to be costing at least $0.20 more per mile to operate in terms of parts and outsourced repair costs compared to similar vehicles.

According to calculations based on the fleet data in the Business Systems Information Portal (BSIP),[1] each VT365 replaced with a comparable ISB 6.7L engine would reduce operational parts expenditures by an average of $2,246.31 per year based on the average annual mileage of 11,231.55 miles. The impact would be greater initially as the new bus would be under warranty. Additionally, each VT365 replaced would reduce fuel use by an average of 189.5 gallons per year, valued at $379 annually at $2 per gallon. This is a combined maintenance and fuel savings of over $2.1 million per early year of replacement of 815 buses, or an estimated $15 million in operating expenditure savings over an approximate 7 years of early replacement. This figure does not include the

[1] BSIP is the statewide fleet and inventory management software used by DPI.

savings gained from the vehicle being a newer model year, just the year-over-year savings of getting the poor performing engine out of the fleet.

ii. Labor Expenditures to Maintain Different Models

TABLE 2 – Labor Hours per 1000 miles travelled (7/14 – 6/16)
(* Sufficient vehicles of that model do not exist for comparison)

Vehicle Chassis Model Year (Engine Model 1-2 yrs older)	ISB6.7 / MBE 900 (Hours / 1000 mi)	VT 365 / MxF 7 (Hours / 1000 mi)
2014 – ISB + MxF7	3.25 (ISB)	*
2013 – ISB + MxF7	3.13 (ISB)	3.93 (MaxxForce 7)
2012 – ISB + MxF7	3.51 (ISB)	*
2011 – ISB + MxF7	*	3.51 (MaxxForce 7)
2010 – ISB + MxF7	4.70 (ISB)	*
2009 – ISB + MxF7	4.94 (ISB)	*
2008 – MBE + VT	5.68 (MBE)	5.60 (VT365)
2007 – MBE + VT	5.08 (MBE)	6.98 (VT365)
2006 – MBE + VT	5.36 (MBE)	7.35 (VT365)
2005 – MBE + VT	5.13 (MBE)	*

The number of labor hours required to maintain the VT365 engine rapidly expands over time. The MaxxForce 7 is a newer-emissions version of the VT365 and so is included as well for reference purposes. As of 2016, the 2006 model VT365 is requiring more labor hours per 1,000 miles than all the other existing school buses in the fleet, even those currently eligible for replacement (1998 Models). If this trend continues, the need for additional labor resources will continue to increase.

iii. Miles-Per-Gallon (MPG) Comparison by Engine

TABLE 3 – Average MPG for the Fleet by Engine Type

	CAT 3116/3126 (Caterpillar)	**MBE 900 (Mercedes)**	**ISB 6.7L (Cummins)**	**T444E (Navistar Int)**	**VT365 (Navistar Int)**	**MxF DT (Navistar Int)**	**MxF 7 (Navistar Int)**
Overall	6.64	7.10	6.80*	6.42	**6.28**	6.15	**6.52**

Covering the same period from July 2014 through June 2016, miles-per-gallon (MPG) on the problematic engines (VT365 and MaxxForce 7) overall appears to be lower than the MPG associated with other engines.

*When removing the older ‘pre-2010’ emissions ISB 6.7L Cummins engines, the average MPG for Cummins rises to 7.02 over the period.

TABLE 4 – Reduction in Fuel Use if a Vehicle were Replaced with a Modern ISB 6.7L

	Baseline Modern ISB 6.7L	T444E (Navistar Int)	VT365 (Navistar Int)	MxF DT (Navistar Int)	MxF 7 (Navistar Int)
Overall	7.02 (0%)	8.5%	10.6%	12.4%	7.2%

If the VT365 was replaced with newer Cummins ISB 6.7L engines, fuel consumption and its associated costs would be reduced. The engines of primary concern from a maintenance perspective are the VT365. Based on data over the period, each VT365 replaced would reduce fuel use by an average of 189.5 gallons per year. At $2 per gallon, that is an annual fuel savings of $379.06. This is in addition to the reduced per mile repair expenditures discussed previously.

iv. Downtime and Intangibles

If the real costs of operating VT365 engines are indeed higher, LEA transportation departments will compensate by using these buses less and relying more on the rest of their fleet. In other words, LEAs may find it to be more cost effective to use their fleet in a way that would be considered inefficient apart from the excessive costs of those models.

In addition to having higher actual costs of ownership in general, these engines fail at a higher rate than their peers. Engine failure is one of the most disruptive operational problems that can occur. Because these failures can happen while the vehicle is in operation, buses prone to engine failure present a serious safety risk to students. Furthermore, engine failure takes longer to repair than any other engine problem, resulting in long periods of time when these buses are out of service. In some LEAs, this will not only require a spare bus for an extended length of time, but could result in the LEA needing an additional bus and driver to handle the larger capacity bus being out of service.

This type of breakdown also poses a public relations problem because parents begin to view the school bus system as unreliable. This does an unknown amount of damage to the reputation of the LEA, its transportation department, and the public school system in general.

Greater fuel consumption and hazardous emissions from these buses pose a greater threat to the health and safety of children and others than the emissions from newer school buses.

Replacing the VT365 engine buses early reduces the time that these fuel-inefficient, higher emissions vehicles will be required to transport schoolchildren around the state. By doing so, North Carolina will have a more reliable and efficient school transportation system for years to come. Furthermore, a reliable bus system creates educational

opportunities for children that may not exist for them otherwise, and those opportunities will pay economic and social dividends far into the future.

c. Funding Source Benefit

As funding is sourced from lawsuit proceeds, and, since governmental agencies can claim 100% of the cost of new vehicles being used to replace existing vehicles before their normal end of life, school buses purchased with these funds will be at the beginning of their life cycle, representing a significant cost savings for the General Fund.

The benefit would be a reduction in future replacement bus outlays from the General Fund mostly centered around FY2026 through FY2029. It will also impact costs to LEA transportation departments and local governments through reductions in labor and materials costs. A rough projection of the general fund savings based on the use of VW funds is $92 million 2026 dollars based on historical data purchasing and cost data.

d. Environmental Impacts of Early Replacement

The 2006 and older engine model year buses are significantly more polluting than modern school buses. Upgrading these vehicles early will yield emissions reductions of ~90% of NOx (Nitrous Oxide) emissions, 98% of PM2.5 (Particulate Matter), 92% of HC (Hydrocarbons), 91% of CO (Carbon Monoxide), and use less fuel.

EPA Diesel Emissions Quantifier Results (10 Electric, 25 Propane, and 780 New Diesels)

Annual Results (short tons)[2]	NO_x	PM2.5	HC	CO	CO_2	Fuel[3]
Baseline for Upgraded Vehicles	63.747	5.338	8.704	31.951	16,402.9	1,458,035
Amount Reduced After Upgrades	57.199	5.233	7.965	29.174	1,859.7	165,310
Percent Reduced After Upgrades	89.7%	98.0%	91.5%	91.3%	11.3%	11.3%
Lifetime Results (short tons)[2]						
Baseline for Upgraded Vehicles	446.232	37.367	60.927	223.660	114,820.3	10,206,245
Amount Reduced After Upgrades	400.394	36.629	55.752	204.219	13,018.2	1,157,170
Percent Reduced After Upgrades	89.7%	98.0%	91.5%	91.3%	11.3%	11.3%

e. Additional Key Considerations

i. Localized Emissions Benefits

School buses predominantly travel where people live. As such, they disproportionately impact environmental conditions in residential areas and around schools when compared with other large sources of diesel emissions.

In addition, there are numerous students on board each school bus who are exposed to the air quality in and around the vehicle for extended periods of time.

Further, once the many different school buses and parent vehicles arrive at the school, the emissions in the area increase greatly during the time the school buses and car-riding students are entering or exiting the vehicles.

The vehicles we are targeting are the last vehicles purchased before significantly more stringent emissions standards took effect in 2007. This allows us to maximize the emissions reductions faster.

ii. Project Visibility and Media Coverage

School buses are iconic of public education across the nation. This means that issues involving school buses garner significant media attention. Some emissions reduction projects travel under the radar and reduce emissions in invisible, non-tangible ways. A school bus emissions reduction project has no such issue. A project to replace aging and higher emissions school buses with new buses, including propane and electric models, will attract positive publicity to public schools. That platform can be used to showcase the tangible, real-world impact of spending VW settlement money. Each delivery of a pilot model electric or propane bus is an opportunity for a covered media event that will enhance the public perception of the school bus and the state and local governments involved.

The importance of this media coverage and the impact cannot be overstated. School buses keep cars off the road and away from schools at an average rate of approximately 36 vehicles for each school bus. Students are 70 times more likely to get to school safely in a school bus than in a car. Even though this government service is provided across the state to families free-of-charge, some parents choose to transport their own children to school, which results in higher emissions at the school as they wait in line to drop off or pick up students.

Promoting school bus service and its safety, economic, and environmental benefits with a project to reduce emissions in and around school will encourage more parents to consider utilizing the school bus system for their child’s school transportation needs.

iii. Past Performance and Administrative Benefits

DPI has had several projects in consultation with DEQ over the years, including school bus emissions retrofits and replacements. We have participated in federal and state grant proposals and projects including HB1912 (Retrofits and Replacements), DERA, Clean Diesel Rebates, MSERG (Mobile Source Emissions Reduction Grants), and we were one of a small number of states to be involved in a plug-in hybrid-electric school bus pilot project.

One of these projects “Clean School Bus NC: Kids Breathe Here” was awarded an EPA Clean Air Excellence Award in 2014.

We also have experience with large multi-county purchases of school buses and LEAs are already required to collect operating data on the use of all school buses. The addition of purchasing and monitoring these replacement vehicles would have little administrative impact. As such every dollar of the project could go towards the purchase of the actual vehicles and not towards the administrative cost of the project.

Phillips, Brian

From: Tom Schaaf <TSchaaf@carolinathomas.com>
Sent: Thursday, December 21, 2017 3:33 PM
To: daq.NC_VWGrants
Cc: Tom Schaaf; kenneth.hedgecock_jr@daimler.com; mario.difoggio@daimler.com; Phil Loflin; Roy Parks; Bob Price; james.crowcroft@daimler.com; james.d.allison@daimler.com
Subject: [External] Response to NC VW RFI
Attachments: Cost proposal estimates of options.xlsx; Response to NC VW RFI.pdf

Please accept our response to the NV VW RFI. We respectfully submit the following. Our response is titled "Response to NC VW RFI and we have also included a working spreadsheet that can be used to calculate costs for specific numbers of buses in this proposal. Changing the numbers of buses in each category calculates the VW investment based on current NC State bid prices.

Section 1: Project Applicant:
Carolina Thomas, LLC
Contact: Tom Schaaf, VP/GM
Private Co. providing for Government entities
Mailing Address: 6327 Burnt Polar Road, Greensboro, NC 27409 (PO Box 18209/27419)
800-440-3492
tschaaf@carolinathomas.com

Section 2: VW Program and Solicitation Design Questions:

- North Carolina has the oldest school bus replacement cycle in North America with 7000 buses older than 2009. If the entire VW fund was utilized, 1099 of these older polluting buses could be replaced. There is an existing state bid that is a menu bid which created exceptional competition.
- The cost proposal spreadsheet allows you to select how many old buses in each category to calculate the spend.

Section 3: Mitigation Category:
#2. Class 4-8 School Bus and Activity buses for the NC Public School Systems in all 100 NC counties.

Presentation response shows all categories of emission's benefits. It is presented as a holistic approach that considers the total benefit to the NC environment due to the investment made by NC companies such as 100% Landfill Free Status and the entire emission range of NOx, CO, CO2, M-MHC, PM etc.

Manufacturing tours are available as the companies involved in these proposals are in High Point, NC, Rocky Mount, NC and Salisbury, NC if this will help educate this committee.

3 options are presented for consideration:
Option 1: Replace older emission buses with Cummins Clean Diesel buses using state bid prices on contract #201501312.
Option 2: Replace older emission buses with Salisbury, NC propane buses using state bid prices on contract #201501312.
Option 3: Replace flawed emission International Engine with Cummins Clean Diesel. There are 800 of these.

Sincerely,

Tom Schaaf
Vice President/General Manager

Carolina Thomas™

Bus Sales | Service | Parts | Body Shop

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O (336) 851-1718 Ext. 368 | **M** (336) 362-5209
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NC Active In-Service School Bus Fleet Count

Year of bus	Total Quantity of NC buses in service by age.	Input the number of old buses in here agreed to replace.	Cost of NEW 72 passenger Cummins Clean Diesel on State Contract 201501312. Bus built in High Point, NC. Engine built in Rocky mount, NC $83698 8-10 mpg	Cost of NEW 72 passenger *Propane Engine on State Contract 201501312 Bus built in High Point NC. Engine built in Salisbury NC $96298 3-4 mpg	Repower International VT365 with Cummins Clean Diesel. Flawed emission system. $34,000/bus. 8-10 mpg
1995 (23 years old)	**3**	**3**	$251,094	$288,894	
1996 (22 years old)	**46**	**46**	$3,850,108	$4,429,708	
1997 (21 years old)	**73**	**73**	$6,109,954	$7,029,754	
1998 (20 years old)	**582**	**582**	$48,712,236	$56,045,436	
1999 (19 years old)	**532**	**395**	$33,060,710	$38,037,710	
2000 (18 years old)	**409**		$0	$0	
2001 (17 years old)	**648**		$0	$0	
2002 (16 years old)	**125**		$0	$0	
2003 (15 years old)	**143**		$0	$0	
2004 (14 years old)	**661**		$0	$0	
2005 (13 years old)	**731**		$0	$0	
2006 (12 years old)	**722**		$0	$0	Replace 800 of these flawed emission
2007 (11 years old)	**679**		$0	$0	international engines in this vintage.
2008 (10 years old)	**1285**		$0	$0	
2009 (9 years old)	**380**		$0	$0	
Total Units	**7019**	1099	$91,984,102	$105,831,502	$27,200,000

Carolina Thomas Options for consideration

Option 1: Cummins Clean Diesel	**Clean Cummins Diesel - NC State Contract Cost ea.**	$83,698
Option 2: Agility Propane	**Agility Propane - Thomas Bus Contract Cost ea.**	$96,298
Option 3: Replace flawed International engine emissions with new Cummins	**Repower International Brand Bus w/ Flawed Emission System VT365 Engine with Cummins Diesel. There are 800 of these buses in the fleet. This project would involve multiple companies all across the state of NC that are already certified to do the work each.**	$34,000

Change this number to represent buses replaced for a particular strategy and the spreadsheet calculates the cost on State Bid pricing.

1. ***How should DEQ prioritize projects?***

North Carolina has the oldest school bus replacement cycle in North America with 7000 buses older than 2009. If the entire VW fund was utilized, 1099 of these older polluting buses could be replaced. There is an existing state bid that is a menu bid which created exceptional competition. Projects should be reviewed based upon opportunity to reduce all emissions and not focus on just one area and ignore the rest. And is the program sustainable when special funds evaporate. Costs should include not only the technologies capital cost, but also the other costs associated with the program proposed (fueling and maintenance infrastructure, training, certification, etc.).

2. ***What is the anticipated demand for each eligible project type?***

North Carolina has the oldest school bus replacement cycle in North America with 7000 buses older than 2009. If the entire VW fund was utilized, 1099 of these older polluting buses could be replaced. There is an existing state bid that is a menu bid which created exceptional competition. There have been pilots with other alternative fuels in school buses besides clean diesel. They did not work. In fact, the pilot units are being offered for sale now in this market for a fraction of the cost of a new unit. The fuel consumption was nearly 2x that of the low emission clean diesel units. The engines cost considerably more even though based on a light duty platform and the total bus cost considerably more. The buses do not have an automatic transmission like the counties are equipped to handle. North Carolina school buses are on a 20-year replacement cycle so the engine platform is extremely important and the transmission is extremely important.

3. ***The percentage of trust funds, if any, that DEQ should devote to Light Duty Zero Emission Vehicle Supply Equipment?***

All areas should be considered. 10% of the funds would represent a good balance and distribution of funds for light duty.

4. ***What is the anticipated demand for specific types of diesel emission reduction projects not eligible under the VW settlement but otherwise eligible under DERA or other state programs?***

We are not able to comment on various eligible DERA projects or others.

5. ***Should a certain percentage of available VW funds be allocated to each eligible project type and if so how should the percentage be determined?***

VW Funds should be distributed to those projects that have the most impact on a holistic emission reduction but also those that are sustainable over time. When the grants and special funds no longer exists can the project support itself? All factors should be included and debated in an open forum where competing opinions are available at the same time. When claims are made where did the data come from to make the claim? Did it consider an engine or transmission that will not last as long as an example or does it ignore certain data points?

6. ***Should a certain percentage of available Mitigation Trust funds be reserved for government projects?***

North Carolina has the oldest school bus replacement cycle in North America with 7000 buses older than 2009. If the entire VW fund was utilized, 1099 of these older polluting buses could be replaced. Start with the oldest most polluting vehicles and work toward newer to have the greatest impact on the environment as a whole.

7. ***Should funds be geographically distributed, and if so how?***

Large communities should not have an advantage over rural communities. If you work from the oldest most polluting old buses the rural areas can benefit as well. There are 100 counties that operate school buses. If the project size was not a limiting factor all counties regardless of their financial strength could participate. A single bus can be as important to a poor county as 10 buses to a wealthier county.

The safest form of fuel in a school bus is low emissions clean diesel. It does not have to have a special fuel tank that resists puncture as it is safe in its standard state. As an example, CNG is stored at 3500 psi which takes a special tank. Propane is stored with a puncture resistance tank as it is required for safety. Propane is lighter than air and settles and pools on the ground. This is extremely dangerous in a confined shop with floor drains, or water heaters, etc. A diesel fuel tank can be filled to capacity with standard equipment. Propane or CNG cannot. If all emissions are considered and fuel consumption rates, clean diesel is the best holistic approach.

8. ***Should governmental entities be required to provide matching funds and if so, how much?***

No. They have finite budgets. The bus replacement schedule is already established over years of use. The fuel prices are dictated by state bids. This is why alternate fuels such as propane are so risky for virtually no benefit over today's clean diesel units. If funding is interrupted the district is left to take the money from other areas to continue to operate. Some alternative fuel vehicles consume two times as much fuel so this could be financially devastating if there are not guaranteed subsidies. If all data and costs are considered with today's clean diesel vehicles an alternate fuel such as propane or CNG does not provide a lower cost of operation. Data has to be eliminated, not included, or compared to flawed engines from a previous time in order to provide projected savings. Infrastructure for fueling such as propane can often be provided free by an entity IF the consuming entity agrees to purchase fuel from only one source. This is not how it works with other fuel types. Infrastructure is only going to be free IF there is some caveat of single source fuel, etc. The leading propane school bus provider in North America lost $7.5M in Q1-2018. This needs to be seriously considered These buses in NC are on a 20-year rotation cycle.

9. ***Should DEQ establish a minimum project size and if so, what size?***

We would hope that rural areas have an equal opportunity.

10. ***In addition to evaluating a proposed project's total cost effectiveness ($/ton), what other key factors should DEQ consider when evaluating projects?***

The project should focus on a holistic approach. Not just an emission like NOx. Consider all emissions. Consider tests of alternate fuels to date in NC in this application. What is the actual fuel consumption rate? What is the actual equipment being used to provide the solution? As an example, do the specifications for the bus have to be altered for the transmission because the provider will not engineer

the vehicle to meet the specs? Does the end user have to purchase fuel from a sole source in order to afford the infrastructure? Does the fueling timeline specification have to be eliminated in order for the vehicle to meet specifications? (Clean diesels have a fueling standard to eliminate labor).

11. ***What other feedback do you have on project evaluation and/or scoring criteria?***

Funding programs that allow the clean fuels to compete on their own merits are the most desired. Special focus or advantages on just one emission criteria are flawed even though they may get publicity. Is the vehicle built in North Carolina? Is the engine built in North Carolina? If government subsidies are discontinued is the vehicle still going to provide the benefits? Clean fuel should also include low emission clean diesel. The safety of handling any type of fuel should be experienced versus listening to just vendors. How is the equipment serviced? How is the equipment stored? How is the fuel transported? As an example, most of the time these alternative types of fuels are transported to schools or business using clean diesel as they are proven to do the most work at the lowest possible cost.

12. ***What publicly available tool(s) should be used to quantify anticipated emission reductions/offsets for eligible mitigation projects?***

Use Federal EPA information. Gather complete emission data versus one specific emission that promotes one fuel type. Look at propane study performed by State of North Carolina – DPI at actual locations in NC. This is real world experience. Compare existing data from 100 counties. Tour manufacturing facilities in North Carolina. There are school buses built in North Carolina. There are clean diesel engines built in North Carolina. Agility (propane engines) is in North Carolina.

13. ***What methods could DEQ employ to reduce barriers and increase participation in future solicitations for projects?***

The process appears transparent thus far and we encourage the state to continue these measures. Ask others for input. Many of the alternative fuel meetings are loaded for a specific view. Many things are not vetted and data is considered factual.

14. ***What information/resources would be most valuable for stakeholders interested in submitting projects and what is the best way to communicate those?***

Carolina Thomas and Thomas Built Buses respectfully request to be involved in these discussions at every possible point. We can facilitate learning opportunities at a NC school bus manufacturing facilities, NC clean diesel engine manufacturing facilities, NC propane engine facilities, and NC maintenance garages. We focus 100% specifically on school buses. Our firm includes over 700 years of school bus equipment experience. Thomas has 100 years of experience in NC and they offer a wealth of information on the bus specifications and operation.

One of the most important aspects of this program is that North Carolina electrify, rather than refurbish and replace old diesel engines with new diesel or natural gas engines.

This is not only important in that we move away from fossil fuels, but this is also incumbent upon the state and that North Carolina will receive more funding.

Putting money toward vehicle charging stations is smart, and if the state does this coordinating this spending with the other pool of money meant exclusively for charging stations will be key.

Additionally, I believe it is wise to invest in electrification of buses. Buses transport many people (esp kids for school) and are more highly concentrated in poor, minority, and EJ communities. Buses will also be an easier target because data will be more readily available than for other technologies, and this will make modeling emissions reductions easier compared to alternative investments.

One thing for DEQ to consider is where progress toward electrification is inevitable. With this in mind, focusing on electrifying port technologies, for example, may be wise. Vehicle electrification seems all but guaranteed, but this is not the case with Port Drayage machinery, for example.

Finally, it would be wise for the state to make great use of leveraging DERA matching funds. I strongly urge DEQ to engage heavily in this program.

Best,
Seth Yeazel

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