

December 5, 2017

John Niermann
Commissioner
Texas Commission on Environmental Quality
Air Quality Division
Implementation Grants Section, MC-204
12100 Park 35 Circle
Austin, TX 78753

ATTN: VW Settlement

Dear Commissioner Niermann:

I am writing in reference to the \$2.9 billion Environmental Mitigation Trust (“Trust”) established in the VW settlement, and specifically \$209 million in funding designated for the State of Texas. The Commission on Environmental Quality (TCEQ) is seeking public comment concerning how the settlement money should be distributed, accounted for and how to maximize the air quality benefits generated by projects funded through the Trust.

We appreciate the opportunity to comment on this important issue. By way of background, the Diesel Technology Forum represents manufacturers of diesel engines, vehicles and equipment. The Forum is a not-for-profit educational organization dedicated to raising awareness of the clean air and economic benefits of clean diesel technology. More information on the Forum is at www.dieselforum.org.

As you know, the purpose of the Trust is to reduce emissions of oxides of nitrogen (NOx) as a mitigation measure against the excess emissions from the almost 600,000 VW vehicles found to have been deployed with technology that sidesteps NOx emission controls.

As Texas evaluates the options for the \$209 million provided through the Trust, we believe that it is vital that the selected approach be one that ensures near-term and proven NOx benefits and makes the most of the funding.

That approach is upgrading and replacing existing heavy duty diesel engines, vehicles and equipment with new technology clean diesel engines. This approach will deliver the greatest reductions in NOx emissions, in the shortest timeframe and make the most cost-effective use of Trust revenue. It will provide more clean air benefits for the dollar and provide those faster than other approaches.

The State will undoubtedly receive many arguments and proposals for investing in various alternative fuels and technologies or charging infrastructure investments for electric vehicles. In nearly all these cases the costs would be higher, the incremental NOx benefits would be lower and they would accrue over a longer term than any clean diesel replacement options.

Summary

- According to the latest NOx emissions inventory, the largest sources of NOx emissions in Texas are attributable to engines that power heavy duty vehicles and equipment. Therefore, the most important opportunity for NOx mitigation in Texas is replacing heavy duty engines or the vehicles and equipment they power with new technology.

- Recent EPA, DOT and other sources studies conclude that the most **cost effective strategy to reduce NOx emissions from heavy-duty sources are investments in the latest clean diesel technology.** Investing Trust revenues in replacing older commercial vehicles with clean diesel technology will allow for greater immediate term air quality benefits beyond that of investments in other technologies, and provide more direct benefits to more small businesses and regions throughout Texas than would other technologies and approaches.
- Upgrading or replacing older off-road engines including construction and agricultural equipment and even larger engines that power switch locomotives yields enormous air quality benefits and is one of the most cost effective near term NOx investments that also would have one of the lowest administrative burdens for TCEQ relative to other options that would entail a greater number of vehicles or projects.
- Finally, the Trust provides that funds are eligible to be used as part of non-federal matching grants for eligible Diesel Emission Reduction Act (DERA) projects. This option would provide an even greater ability to introduce more new clean technology in a wider variety of off-road construction equipment throughout Texas.

1. Diesel Powers Texas' Commercial Vehicle Fleet

According to recent commercial vehicle-in-operation data collected by the Diesel Technology Forum, there are 933,432 Class 3-8 vehicles in use in Texas powered by a diesel engine and 2,576 powered by natural gas (CNG) as of 2016. More Texas truckers are choosing to invest more in clean diesel than alternative fuel technologies. Of the diesel vehicle fleet, 35.6 percent or 332,169 are powered by a clean diesel engine deployed with the latest NOx reduction control technology (i.e. 2011 and newer model vehicles). This leaves 601,253 commercial vehicles in Texas' fleet that do not come with the latest near-zero NOx emissions control technologies.

2. Clean Diesel Yields Proven Clean Air Benefits

As a result of decades of research and investment, clean diesel technology yields near-zero emissions and is widely available today to provide immediate term air quality benefits. Clean diesel refers to a system of cleaner diesel fuel, advanced engine designs and after-treatment technologies to meet the most stringent emissions requirements established by the U.S. Environmental Protection Agency (EPA) for heavy-duty on-road vehicles and off-road equipment. Those standards require near-zero emissions, including NOx, for commercial vehicles beginning with model year 2010 and off-road equipment beginning in 2014. A new heavy-duty truck powered by a clean diesel engine certified to the model year 2010 EPA emissions standard on the road for one year can reduce emissions of NOx by 2.3 tons relative to a truck manufactured to meet the previous emissions standard. Greater adoption of clean diesel technologies that reduce NOx emissions would help Texas improve air quality faster than other approaches.

It takes more than 50 clean diesel trucks (2017 model year) to generate the same level of NOx emissions as a single truck manufactured in 1988.

Equally impressive emission reductions are achievable from the latest clean diesel engines that power off-road equipment including construction and agricultural equipment, locomotives and marine vessels. Depending on horsepower range, these clean diesel "Tier 4" engines reduce NOx emission by 90 to 94 percent relative to the oldest generations of engines. Many of the oldest engines are in use in rail operations and replacing these engines with "Tier 4" engines yield enormous air quality improvements.

3. Clean Diesel is the Most Cost Effective Investment of Trust Fund Dollars

While the settlement presents Texas with an unexpected source of revenue, how the state chooses to invest the dollars can maximize and expand the \$209 million through the investment in cost-effective strategies. The most cost effective strategy to replace older commercial vehicles is investments in clean diesel technology. On a dollar-for-dollar basis, recent evidence suggests that investments in proven and available clean diesel technology are a more cost effective investment to reduce NOx and achieve the clean air priorities established by the Trust to generate immediate term benefits for Texas residents.

The state should weigh the utilization and availability of the technologies vying for the settlement funding.

- Consider investments in electric vehicle charging infrastructure. What is the incremental increase in utilization of such infrastructure by a relatively small population of vehicles traveling low annual mileage?
- Compare those investments to a replacement strategy for a single heavy-duty diesel truck that is 8 years old and travels 80,000 to 100,000 annual miles a year, with a majority portion being in Texas. The truck has far higher NOx emissions than many multiples of passenger vehicles. Replacing an older heavy-duty truck with a newer technology truck, will achieve more NOx reduction than investments in electric vehicle charging infrastructure.
- Natural gas engines today are not available in the full range of size and horsepower to serve all of the needs of Texas truckers, thereby limiting the market interest in investing in these technologies because of their special fueling requirements and other limitations.

According to key sources, clean diesel technology is the most cost effective means to reduce NOx emissions from a variety of commercial vehicles.

U.S. Department of Transportation: CMAQ Program (2015)

The U.S. Department of Transportation, using the latest emissions model generated by the U.S. Environmental Protection Agency, found that 1 ton of NOx emissions may be eliminated by investing, on average, \$20,000 in clean diesel technology versus, on average, \$1 million in electric infrastructure.¹ Replacing a model year 2000 engine found in a Class 8 truck, a school bus and a transit bus with a model year 2015 diesel engine is a more cost effective strategy than investments in electric vehicle charging infrastructure.

Investment Choice	Emission Reduction (\$/Ton of NOx)
Diesel Engine Replacement: Heavy-Duty Truck	\$13,748
Diesel Engine Replacement: Transit Bus	\$51,131
Diesel Engine Replacement: School Bus	\$77,315
Electric Vehicle Charging Infrastructure	\$1,462,694

¹ [Congestion Mitigation and Air Quality \(CMAQ\) Improvement Program Cost-Effectiveness Tables Development and Methodology](#) (December 3, 2015)

U.S. Environmental Protection Agency: National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gases at U.S. Ports (October 2016)

The U.S. Environmental Protection Agency similarly concluded recently that investments in clean diesel technology are a more cost effective strategy to immediately reduce NOx emissions from older port trucks than emerging alternatives such as battery electric commercial trucks.² Investments in clean diesel generate greater NOx reduction benefits.

	Replacing a pre-1991 Class 8 port truck with.... Model year 2010 or newer Diesel	Replacing a pre-1991 Class 8 port truck with.... CNG	Replacing a pre-1991 Class 8 port truck with.... Battery-Electric
Lbs of NOx reduced	1,282	1,292	1,326
Cost of technology	\$110,000	\$140,000*	\$220,000
\$/Lbs of NOx	\$86/lbs	\$107/Lbs	\$165/Lbs
* Based on average \$30,000 price premium of a new Class 8 CNG tractor relative to a comparable new diesel tractor			

Clean Air Task Force

Examining the benefits of clean diesel relative to CNG in the transit bus fleet, the Clean Air Task Force reached a similar conclusion – greater NOx reduction can occur by replacing older transit buses with new clean diesel models as opposed to investments in CNG equipment.³ New diesel engines, while generating slightly less NOx than a comparable CNG transit bus, also come at much lower expense. The Clean Air Task Force estimates that a comparable CNG bus costs about \$70,000 more and also requires an investment of \$127,000 in specialized fuel infrastructure and equipment. For a \$10 million investment, more clean diesel buses can be put into service to retire older buses and generate greater air quality benefits than investments in CNG.

\$10 Million Investment to Replace Model Year 2000 Transit Buses		
	Number of Older Buses Replaced	NOx Reduced (kg)
Clean Diesel	25.6	12,698
CNG	20.6	8,639

² [National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gases at U.S. Ports](#) (September 21, 2016)

³ [Clean Diesel Versus CNG Buses: Cost, Air Quality & Climate Impacts](#). Clean Air Task Force. February 2012

4. Upgrading the Largest Engines Generates Enormous Air Quality Benefits

The U.S. Environmental Protection Agency recently concluded that replacing the oldest engines that power some of the largest equipment can generate enormous NOx reductions. From switch locomotives to tug boats and ferryboats, “Tier 4” clean diesel engines can eliminate between 37,000 and 96,000 lbs of NOx each year when replacing the oldest generations of engines. Many of the oldest engines in these large applications are still in service given the longevity and durability of large diesel engines and replacing these engines with proven and available clean diesel technology will provide immediate term NOx reduction. The U.S. Environmental Protection Agency estimates that by 2020, the latest “Tier 4” clean diesel engines will only power between 3 percent and 5 percent of this equipment.

Upgrading this large equipment using Environmental Trust revenue will generate enormous air quality benefits but with minimal administrative costs. A single switch locomotive engine upgrade project yields the same air quality benefits as managing 30,000 passenger vehicle purchase incentives or 29 truck replacement projects. These large applications are in operation in fixed locations, typically urban centers or other areas located near priority air quality designations.

Option	Annual NOx Reduction (lbs) per Project	Equivalent to replacing the oldest port trucks with new diesel models	Equivalent to replacing gasoline passenger cars with a zero emission option*
Ferry: Oldest to Newest Engine Replacement	62,000	48 trucks	48,000 EV cars
Tug Boat: Oldest to Newest Engine Replacement	96,000	76 trucks	74,000 EV Cars
Switch Locomotive: Oldest to Newest Engine Replacement	37,602	29 trucks	30,000 EV Cars
Source: National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gases at U.S. Ports (September 21, 2016)			
* replacing T2 B5 with a zero emission option			

5. The Diesel Emission Reduction Act Program is a proven mechanism to administer a NOx reduction program, and will greatly minimize the administrative burdens on Texas.

Clean diesel technology has a proven track record when it comes to improving the environmental performance of older equipment through the Diesel Emission Reduction Act (DERA) program, and DERA is a familiar and proven program within many air agencies. The Diesel Emission Reduction Act program is a proven, established and ready means to quickly execute projects funded under the Trust with minimal administrative impacts. Since 2008, a variety of state agencies have received an EPA DERA award for retrofitting or replacing trucks and larger off-road equipment.

The \$2.9 billion Environmental Mitigation Trust includes as eligible specialized or niche off-road applications, such as forklifts and airport ground equipment, as eligible categories of funding. However, the Trust does not directly include the enormous variety and population of the most used pieces of off-road equipment including construction and agricultural equipment as eligible projects.

However, the Trust does include a DERA option that allows states to use Trust revenue as the non-federal match in DERA project applications. This would allow Texas to utilize a proven and established system for funding new technology projects and to dramatically leverage the \$209 million into far greater investment and impact through an approach centered on the non-federal DERA match.

This key provision is available to designated lead agencies like TCEQ in the Trust program that enables you to replace or repower a wider variety of off-road equipment and ultimately gives the state greater flexibility for its investment, and the potential to leverage the investment for greater benefits for the state and the project recipients.

6. Texas should invest in proven and available technologies that yield proven clean air benefits. Clean diesel is the most compelling option.

The table below shows cost effectivity for various technology investments that could be incentivized with Texas' Trust funds. Replacing pre-1991 heavy duty trucks with clean diesel trucks would cost approximately \$86 for every pound of NOx removed. Similarly, repowering a Tier 0 with a Tier 4 locomotive engine would cost approximately \$80 per pound of NOx removed. These clean diesel investments contrast this with the cost to replace one MY 2000 bus with an EV bus at \$503 per pound of NOx removed. The table also shows how many total pounds of NOx could be removed by each type of project, if all the \$209 million in funds were used exclusively for such projects. The clean diesel investment strategy would reduce NOx emissions by 6 tons/day - a significant amount, and do so immediately. The table is not meant to provide an exhaustive list of all the projects Texas should consider, but rather a demonstration of the cost effectiveness of investments in clean diesel.

How to Make the Most of a \$209 million Investment for Immediate NOx Reduction

	Price Per Application	# of Vehicles or Equipment placed into Service for \$209 million	Anticipated NOx Reduction per Year per Project	Total Cost to Exclusively Fund a Particular Project	Cost to Remove Each lb of NOx (\$/lb)	Total NOx Reduction (lbs) per year
pre 1991 port truck replacement with Clean Diesel	\$110,000	1,900	1,282	\$209,000,000	\$86	2,435,800
pre 1991 port truck replacement with CNG	\$140,000	1,493	1,292	\$209,000,000	\$108	1,928,771
MY2000 bus replacement with Hydrogen	\$1,200,000	174	1,162	\$209,000,000	\$1,033	202,382
MY2000 bus replacement with Battery-Electric	\$880,000	238	1,162	\$209,000,000	\$757	275,975
MY2000 bus with Clean Diesel	\$370,000	565	1,062	\$209,000,000	\$348	599,886
T0 to T4 Clean Diesel switch locomotive	\$3,000,000	70	37,602	\$209,000,000	\$80	2,619,606

Source: (1) National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gases and U.S. Ports". U.S. EPA (September 21, 2016), (2) "clean Diesel Versus CNG Buses: Cost, Air Quality and Climate Impacts." Clean Air Task Force (2012). (3) "From Deceit to Transformation: How Connecticut Can Leverage Volkswagen Settlement Funds to Accelerate Progress to a Clean Transportation System. CONN PIRG. January 18, 2017. (4) "Consortium to Fund New Flyer Hydrogen Buses to ATransit", Passenger Transport, February 24, 2017. (5) Locomotive engine upgrade cost based on a range of industry estimates.

CONCLUSION

The Environmental Mitigation Trust represents a historic opportunity to provide clean air benefits to communities across the country including those in Texas. The cost effectiveness of investments in proven and available diesel technology make clean diesel a compelling technology to make the most of this historic opportunity to do the most to improve air quality immediately. More clean air, faster, for the dollar can be achieved than through any other approaches.

Thank you for the opportunity to provide insights concerning the benefits of greater investments in clean diesel technology. Going forward, the Diesel Technology Forum looks forward to providing any additional analysis or insight to TCEQ as the state considers efforts to implement strategies to make the most of the Trust. Please contact us at (301) 668-7230 with any questions or concerns.

Very truly yours,



Allen R. Schaeffer
Executive Director