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

Caterpillar appreciates the opportunity to comment on ADEQ’s proposed allocation plan for the state’s share of the \$2.9B Mitigation Trust Fund (MTF) established under the Volkswagen Consent Decree. Pursuant to section 2.0.3 of the 2016 Consent Decree,¹ the *primary* purpose of the Mitigation Trust Fund is to fund Eligible Mitigation Actions, which in turn have the goal of reducing NOx emissions in the United States. Caterpillar believes that ADEQ’s proposed plan could better meet this objective by focusing funds towards Eligible Mitigation Actions which are more cost effective for the corresponding NOx reduction benefits.

Comment 1: ADEQ’s proposed plan invests a disproportionately large amount of its allocated Trust Fund toward CNG school buses vehicles when there are more cost-effective Eligible Mitigation Actions which would realize greater NOx reductions and better meet the stated purpose of the Mitigation Trust Fund.

ADEQ’s proposed plan invests a disproportionately large amount of funding towards CNG school buses, when the cost effectivity for NOx reduction is unreasonably high relative to other mitigation options. Total cost effectivity for school buses has been calculated by proponents of CNG buses at a staggering \$440,000/ton² (lifetime). There are several factors contributing to this poor cost effectivity. School buses:

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

Marine, locomotive, and nonroad equipment have significantly longer service lives, higher load factors and higher usage. As a result, emission reduction solutions offered by Caterpillar for these sectors have cost effectivities that are 30x – 200x better. For nonroad repowers, there are additional commercial options available with a waiver sought under EPA’s DERA (Diesel Emissions Reduction Act) program. DERA funding for state programs is available under the Mitigation Trust Fund (MTF) action 10.

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

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

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

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

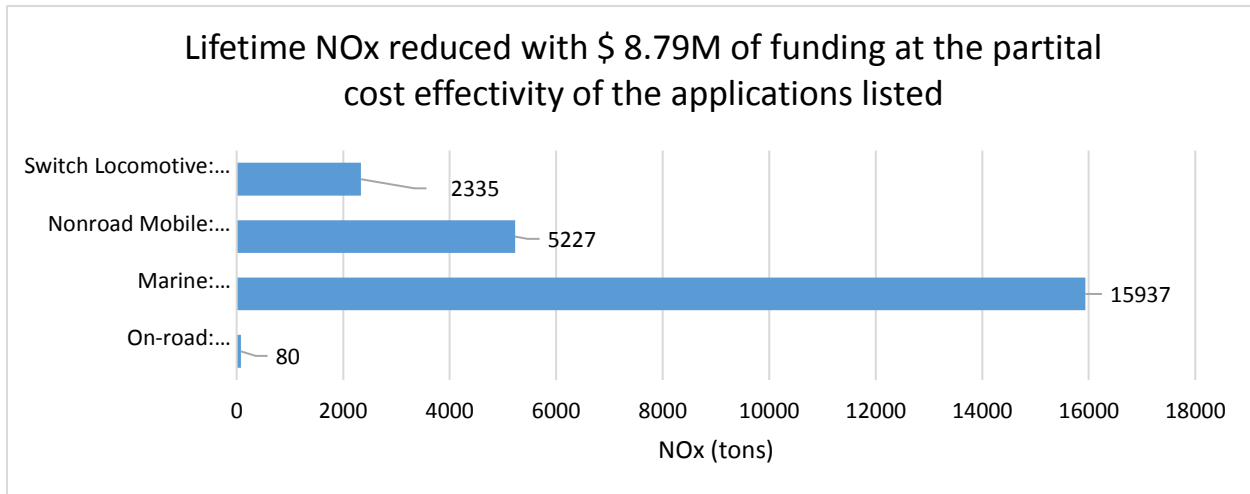


Figure 1: NOx emission reductions available with \$8.79 of MTF

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

In addition to the higher cost per ton of NOx reduced, the proposed plan for electric vehicle grants may be too optimistic about the actual environmental benefits. Currently 75%⁵ of the electric generation in the state comes from the combustion of fossil fuels. Only 7% of Arkansas' electricity is renewable. While Arkansas and the nation progress slowly towards the decarbonization of the electrical grid, the current sources of renewable electricity generation in the state are typically fully utilized; therefore, sudden increases in additional electrical demand (such as would occur by adding more EVs) will likely be met entirely by increased fossil fuel combustion. In contrast, current diesel engines have a CO2 and NOx footprint per kWh that is comparable or slightly better than the average combustion electrical generation source in Arkansas.

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

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

Comment 2: ADEQ’s proposed plan invests a disproportionately small amount of its allocated Trust Fund towards Eligible Mitigation Actions in the locomotive and nonroad mobile sectors, which have been shown to have better cost effectivity for the NOx emissions reduced in line with the stated purpose of the Mitigation Trust Fund.

The Arkansas “emissions inventory” chart, Figure 2 below, is generated from data published by the EPA⁶. It shows that 44.8% of NOx emissions in Arkansas arise from the off-road sectors of marine, locomotive, and nonroad mobile sources combined. We believe these sectors are inadequately represented in ADEQ’s proposed plan and should be proportionally addressed by the Mitigation Trust Funds. The proposal makes no allocation of its MTF to off-road sources. As noted before, however, far greater reductions in NOx emissions can be realized through Eligible Mitigation Actions in these sectors.

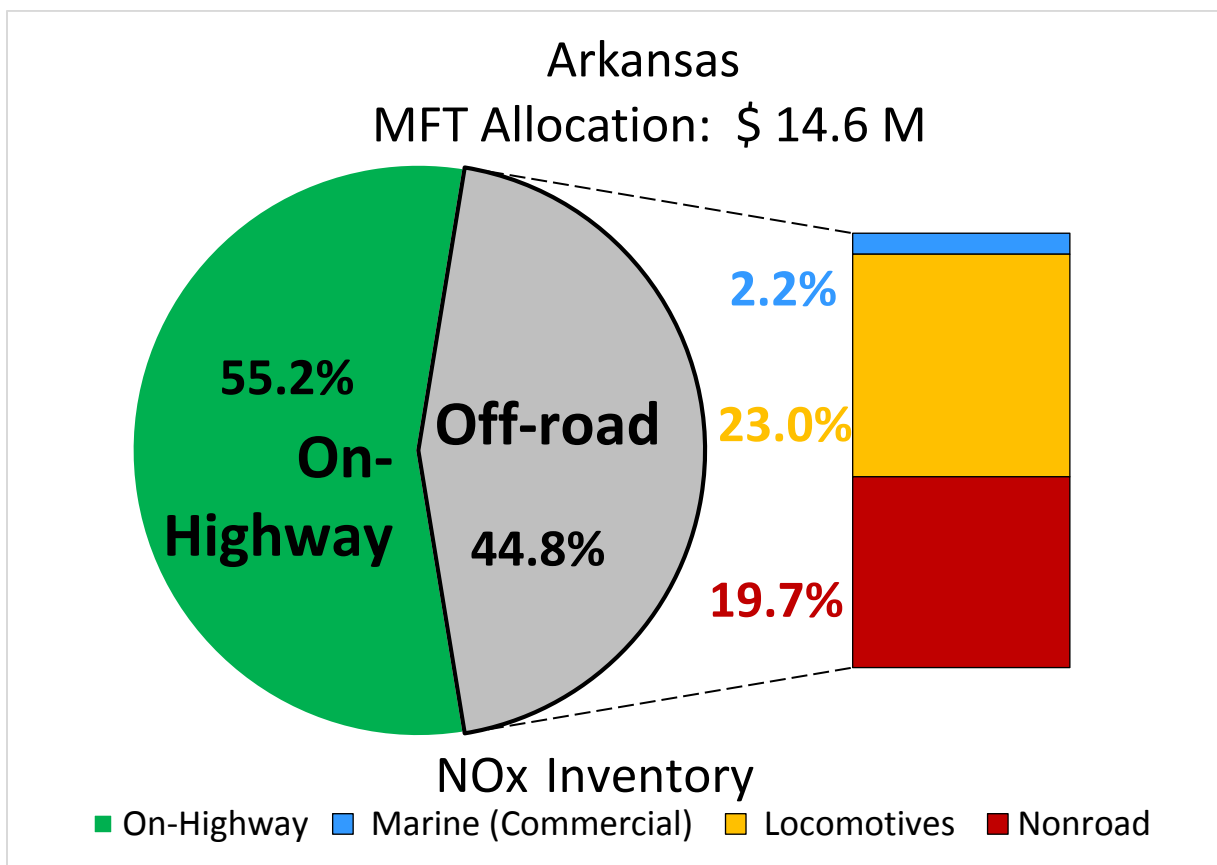


Figure 2: Arkansas Mobile NOx sources

While we recognize that Arkansas does not have to allocate funds proportionally, we believe that ADEQ is not adequately addressing potential NOx reductions from the marine, locomotive and nonroad mobile emissions sectors in its current proposed mitigation plan. These sectors represent a significant portion of the emissions in Arkansas, and Eligible Mitigation Actions in these sectors have the potential to help Arkansas realize greater NOx reductions compared to other Eligible Mitigation Actions.

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

As noted in the ADEQ proposal, all counties in Arkansas are in attainment with NAAQS for all criterial pollutants and ADEQ has indicated priorities with areas that historically have NAAQS attainment issues and those areas that *receive a disproportionate quantity of NOx emissions*. ADEQ subsequently identified the Pulaski, Benton, and Washington counties of having the highest on-road NOx emissions and also the highest number of VW vehicles that are involved in the consent decree. Caterpillar’s emission solutions are more cost effective and reduce far more annual tons of NOx than ADEQ’s proposed CNG school bus replacement plan. Figure 3 below provides a comparison of NOx reduction cost effectivity between some key products that Caterpillar can offer in these Arkansas counties.

Lifetime NOx reduced with \$ 8.79M of funding and the partital cost effectivity of the applications listed

	Cost	VW MTF Funding	Partial MTF Cost	NOx Reduced	Service Life*	Lifetime NOx	Total Cost Effectivity	Partial Cost Effectivity	Proposed Qty **	Total Cost	Partial MTF Cost	NOx Reduced	Lifetime NOx
Arkansas ADEQ Proposal	per unit	percent	per unit	tons/year	years	tons	\$/ton	\$/ton	units	all units	all units	tons/year	tons
On-road: CNG School Bus	\$ 148,000	25%	\$ 37,000	0.067	5	0.34	\$ 441,133	\$ 110,283	237.53	\$ 35.15 M	\$ 8.79 M	16	80
Caterpillar Nonroad Repowers													
Marine: Upg Kits 16cyl 645FB 1042+	\$ 475,000	40%	\$ 190,000	14.98	23	344.54	\$ 1,379	\$ 551	46.3	\$ 21.97 M	\$ 8.79 M	693	15937
Nonroad Mobile: CAT 966 Loader, UR -> Tier 4 Interim	\$ 118,000	40%	\$ 47,200	2.807	10	28.07	\$ 4,204	\$ 1,682	186.2	\$ 21.97 M	\$ 8.79 M	523	5227
Switch Locomotive: EMD24 remanufacture, UR->Tier 4	\$ 2,600,000	40%	\$ 1,040,000	13.813	20	276.26	\$ 9,411	\$ 3,765	8.5	\$ 21.97 M	\$ 8.79 M	117	2335

* Quantities are for cost comparison purposes. Arkansas may not have the listed quantity of units within the state.

** Service life for a school bus is approximately 16 years, however, since school buses within 5 years of retirement are more likely to be replaced, the emissions benefit is calculated over those 5 years.

Figure 3: Cost Effectivity Comparison

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

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

The ADEQ proposal includes \$8.79M to be used to purchase CNG school buses (first row of data above). This type of investment would yield 80 tons/year reduction of NOx at 25% partial funding. On the other hand, the listed off-road NOx reductions options could yield up to 200x more reduction in NOx for the same amount of money spent. This difference is due to the significantly better partial cost effectivity of the off-road options as shown in the yellow column above. Although not a mandate of the MTF, the off-road reductions listed above also result in significant PM reductions.

Comment 3: ADEQ should consider increasing its proposed allocation for funding of emission reductions for marine vessels, switcher locomotives, and nonroad equipment in the top NOx counties (i.e. figure B-2 in the ADEQ draft proposal), as these Eligible Mitigation Actions provide the most cost-effective NOx reductions and would benefit the urban areas in Arkansas most impacted by the VW, Audi and Porsche vehicles.

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

Switch Locomotives

Arkansas has approximately 27 switcher locomotives in the State that have various reduction options available under the Eligible Mitigation Actions of Appendix D-2, section (3)(d)(1).



Remanufacture Switch Locomotive EMD24 to Tier 4

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

Nonroad Mobile Machines

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

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

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

Nonroad Repowers – Upgrading from unregulated to Tier 4



657 Scraper, unregulated to Tier 4 (dual engine)

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

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



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

Marine Tugs

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



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

Closing Remarks

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

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

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

Sincerely,



Rey Agama
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Caterpillar Inc.

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