Dear Ms. Burr and Dir. Bird,

The Sierra Club’s Utah Chapter appreciates the opportunity to comment on the recommendations developed by the Volkswagen (“VW”) Environmental Mitigation Plan Advisory Committee and proposed by the Department of Environmental Quality (“DEQ”) for the state’s Environmental Mitigation Plan (“Proposed Plan”). We thank DEQ for leading a careful, transparent stakeholder process to determine best uses of the Environmental Mitigation Trust (“EMT”) funds, and respectfully submit these comments on behalf of our over 20,000 supporters in the State of Utah.

Our overarching aim is to ensure that investments pursued and made by DEQ through the EMT are forward looking, transformative, and cost-effective over vehicles’ useful lives, while meaningfully reducing NOx and other polluting emissions from Utah’s transportation sector. We appreciate that the VW Advisory Committee recommended similar criteria for use of the EMT funds. Given those shared objectives, we offer the following recommendations to improve the Proposed Plan and maximize the impact of EMT funds:

• DEQ should prioritize the use of electric technologies over alternate-fueled options in order to meaningfully contribute to the transformation of Utah’s transportation sector;

• DEQ should use the full 15 percent of the available EMT funds for investment in light-duty electric vehicle charging infrastructure;

• DEQ should focus remaining funds on electrification of medium- and heavy-duty vehicles, as demonstrated, market-ready electric technologies are available for each of
the targeted vehicle segments and electrification;

- In particular, DEQ should pursue electrification of transit buses, which offer superior emissions reductions benefits relative to other technologies, and have a lower total cost of ownership, allowing for agencies to reinvest savings and further expand their clean bus fleets;

- To ensure that DEQ has the necessary support to oversee the program, the Department should increase the funding percentage for its administrative costs.

We explain each recommendation in more detail below.

I. The EMT presents Utah with a unique opportunity to transform its transportation sector; the State should seize that opportunity.

As DEQ recognizes, the EMT presents Utah with a unique opportunity to reduce NOx and other polluting vehicle emissions, to improve the health of all Utahans, and to accelerate the transformation of our transportation sector, which is necessary to meet our air quality and climate goals.

We appreciate that the VW Advisory Committee recommends weighing whether projects deliver “bang for the buck,” “incentivize emerging technologies,” and have “impact in nonattainment areas.” However, we are concerned that the plan carried out by the Department may not ultimately meet these objectives. The NOx calculator developed by DEQ does not consider electric technologies outside of light-duty vehicle charging, and the explicitly “fuel-neutral” nature of the Proposed Plan is likely to result in replacement of vehicles and emissions reductions that would have occurred without the EMT funds. While this approach may yield short-term benefits, the State will make limited long-term gains.

We therefore recommend that DEQ prioritize use of electric technologies in order to lock in long-term emissions benefits and to transform the market. Not only do demonstrated, market-ready technologies exist for the majority of the vehicle types eligible for replacement, in some key cases (e.g. transit buses) the total cost of ownership is lower, allowing reinvestment in additional clean vehicles. Moreover, in all cases the emissions benefits are superior. These benefits exist with Utah’s current generation mix, and will only improve as the generation mix becomes cleaner.

In addition to allocating the full 15% for light-duty vehicle charging infrastructure, DEQ can move electric technologies forward by weighing electrification as a plus-factor in applications for use of the funds, setting incentive levels that will stimulate the market, or, at minimum, carving out a significant portion of the funds for transformative projects.
II. DEQ should allocate the full 15% of available EMT funds to light-duty vehicle charging infrastructure in order to meet State goals and complement current EV infrastructure programs.

To enable and drive EV adoption, it is critical for would-be drivers to have access to charging infrastructure that comprehensively meets their needs. The evolving paradigm for charging infrastructure that fully meet the needs of EV drivers is to provide Level 1 or Level 2 charging in places where people naturally park for extended periods (e.g., the home and the workplace) and to supply DC fast charging along travel corridors to enable extended travel.

In recently joining the Regional Electric Plan for the West—a commitment to collaboratively develop an Intermountain West Electric Vehicle Corridor covering 5,000 miles of I-15, I-70, I-80 and I-84—Utah has recognized the importance and need for DC fast charging across the state. Such a network is not only critical to enable inter-city or distance travel, but consumer research indicates that a “lack of robust DC fast charging infrastructure is seriously inhibiting the value, utility, and sales potential” of EVs.2

Given this ambitious goal and the high cost of deploying DC fast charging infrastructure, Sierra Club urges DEQ to allocate the full 15% allowable to light-duty electric vehicle charging infrastructure, and to focus much of it on a state-wide fast charging network. Sierra Club also supports deployment of charging at multi-unit dwellings, workplaces, and public locations. However, of those locations, we recommend that DEQ prioritize those “long dwell time” locations where cars are most often parked and where access to charging is critical for EV ownership—the home and the workplace.3 In particular, EMT money would be well spent on improving access to EV charging at multi-unit dwellings, where residents face unique challenges to the installation of EV charging.4

In administering this mitigation action, the Department may benefit from modeling the program on Rocky Mountain Power’s $10M EV incentive program being implemented pursuant to the Sustainable Transportation and Energy Act or its $4M DOE WestSmart EV Project—two important projects that are moving the needle on electrification, but, even in combination with the full 15% of the EMT funds, will not support the State’s infrastructure needs under current EV growth projections.

Lastly, to further stretch the funds and maximize station deployment, DEQ may consider using EMT funds for charging station purchase and installation, and allowing the utilities to deliver power to the site or directly to stations. In many cases, the cost of installing supporting infrastructure and delivering power to charging stations is much higher than the cost of the charging station and its installation.5 DC fast charging stations, in particular, are more likely to

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2 PlugShare, New Survey Data: BEV Drivers and the Desire for DC Fast Charging (March 2014).
4 See, e.g., Joint Motion for Adoption of Settlement Agreement by Pacific Gas & Electric Company et al at 65, Case No. A.15-02-009 (filed March 21, 2016), California Public Utilities Commission; DOE, Costs Associated With Non-
require new or upgraded electrical service given the high power requirement and greater likelihood of installation at more remote sites along highways. At minimum, “[i]t is important to work with the utility early in the process to minimize costs, optimize the electrical design, and eliminate scheduling bottlenecks.”

III. DEQ should prioritize the demonstrated, market-ready electric technologies available for the eligible vehicle categories over alternate-fueled options, with a particular focus on transit.

Among the eligible mitigation actions, DEQ proposes to use EMT funds on transit, school and shuttle buses, as well as Class 4-7 and Class 8 local freight trucks. To ensure the program is impactful and transformative, Sierra Club urges DEQ to prioritize electric technologies within these categories, or, at minimum, to carve out a significant portion of funds for electrification.

We make this recommendation because demonstrated electric technologies exist for the majority of the vehicle categories targeted by the program, the immediate NOx reductions of electric vehicles are superior to alternate technologies, and a transition to electric technologies is critical in the long-term to meet federal air quality standards. The EMT should spark that transition.

California’s Air Resources Board (“CARB”), in formulating a strategy to accelerate broader transportation electrification, called for a focus on “deploying zero-emission vehicles in heavier applications that are currently well-suited for broad market development, such as transit buses, airport shuttles, and last mile delivery [trucks]” in addition to continued electrification of light-duty passenger vehicles. CARB’s various technology assessments have also found that these categories are ripe for electrification.

In particular, switching transit buses to electric fuel is more cost-effective on a total cost of ownership basis, and the resulting operations and maintenance (“O&M”) savings allow for additional investment in clean buses while driving down costs. Below, we detail the benefits of transit buses, and also explain how electric trucks and school buses can deliver NOx emissions reductions and share in the same lifetime O&M cost savings as electric transit buses.

a. Electric Transit Buses

Residential Electric Vehicle Supply Equipment: Factors to consider in the implementation of electric vehicle charging stations at 17 (November 2015).

6 DOE, Costs Associated With Non-Residential Electric Vehicle Supply Equipment: Factors to consider in the implementation of electric vehicle charging stations (November 2015).


Switching transit buses to electric fuel is more cost-effective on a total cost of ownership basis, and the resulting operations and maintenance (“O&M”) savings allow for additional investment in clean buses while driving down costs. At the same time, electrifying bus fleets will also work to advance and transform the market, thereby contributing to already sharply falling battery and electric bus costs. Moreover, electric buses offer the most cost-effective NOx reductions.

i. **Electric buses already have lower comparative lifetime costs than diesel buses and CNG buses—and costs continue to fall sharply.**

As discussed below, even today the lifetime cost of an electric bus is significantly lower than that of a new diesel or alternative fuel bus, though the upfront cost is higher. Moreover, as EV bus manufacturing scales up, and as battery costs—the most expensive part of an EV—plummet over time, electric bus prices will fall rapidly as well.

a. **Electric buses have a lower total cost of ownership.**

To be sure, there is an up-front cost premium to purchasing an electric bus over a diesel, CNG bus or hybrid bus. For example, in 2017, a Proterra electric bus costs approximately $789,000, a hybrid bus costs $673,693, a CNG bus costs $542,378, and a diesel costs $483,155.

Nonetheless, even factoring in the cost premium, electric buses are already a cheaper, more cost effective vehicle. As the Argonne National Laboratory’s AFLEET model demonstrates\(^{30}\) that zero emission electric buses have a **total cost of ownership 21% lower than new diesel buses.** Maintenance costs for electric buses are between 70% and 79% lower than for compressed natural gas (CNG) and new diesel buses respectively, contributing to significant cost savings over the lifetime of a bus. Based on currently reported data, each all-electric bus will save Utah’s transit agencies over $200,000 as compared to a new diesel bus purchase.

Moreover, as this electric bus technology continues to develop, all-electric bus up-front capital costs will continue to drop, whereas CNG and diesel bus capital cost trends are continually increasing.\(^{31}\) In addition, although reliable, current publicly available data on hybrid diesel-electric buses are lacking, a lifecycle analysis using data compiled by the California Air Resources Board in 2016 shows that hybrid diesel-electric buses have a total cost of ownership of $1,909,847, over $700,000 greater than an electric bus.

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\(^{30}\) AFLEET is a tool developed by Argonne National Lab to examine light-duty and heavy-duty vehicles’ petroleum use, greenhouse gas and air pollutant emissions and costs of ownership.

The total cost of ownership is derived from Argonne National Laboratory’s AFLEET Model (2017). Fuel prices are adjusted for the Salt Lake, Utah region. Model inputs are populated using averages of fuel economy and maintenance costs reported directly by transit agencies from the years 2014 to 2017 (See Appendix A: AFLEET Inputs and Sources).

Maintenance and fueling expenses typically account for a significant portion of transit bus’s lifetime costs. An investment in zero-emission vehicles will dramatically reduce this figure. As highlighted above, all-electric bus maintenance and repair costs are 79 and 70% lower than the maintenance and repair costs for new diesel and CNG respectively. Moreover, all-electric buses are fueled by regionally generated electricity, which has demonstrated far more reliable pricing as compared to diesel oil and natural gas.

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<tr>
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<td>$0.80</td>
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<tr>
<td>CNG</td>
<td>3.87</td>
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In short, EMT funds are available to meet the higher capital requirements of an electric bus fleet, allowing a transit agency to then lock in the lower lifetime costs of EV buses. Lifetime savings

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32 Metrics derived from Argonne National Laboratory’s AFLEET Model (2017) and ZEB transit studies
33 https://www.afdc.energy.gov/fuels/prices.html
can be re-invested into additional purchases of electric buses, creating a positive economic cycle, where a transit agency can continue to electrify its bus fleet, and further drive down operational costs as electric buses replace the entire fleet. This virtuous cycle improves as battery costs fall.

b. Battery costs and electric bus costs are dropping rapidly.

The cost premium of electric buses is dropping quickly. As manufacturing scales up, and as battery costs—the most expensive part of an EV—plummet over time, ZEB prices have and will continue to fall rapidly.

A Recent California Air Resources Board ("CARB") study shows that every year the price premium for ZEBs decreases and, by 2022, they will be at cost parity with and continue to decrease as compared to diesel buses (see below graph). Therefore, every new bus bought will continue to shift the premium down. Using EMT funds to invest in electric buses now will place additional downward pressure on cost premiums and set the stage for future procurement.

In just three years we have already seen a significant decrease in cost, and by 2022, Proterra and other electric bus companies project that battery costs will decrease by over 30 percent. Cheaper battery costs plus $40,000 in savings per year as compared to diesel buses and $57,000 per year
as compared to hybrid buses make electric technology a truly cost-effective option.

i. On a total cost of ownership basis, investing in transit buses is the cost-effective choice for NOx emissions reductions.

Under the VW EMT, administering agencies must report the anticipated NOx reductions from use of the EMT funds. Many agencies are in search of the investment that results in the greatest NOx lb/$ ratio, but they are only considering the upfront purchase costs in these calculations. If the total lifetime costs are considered, the bus technology with the greatest NOx lb/$ ratio is a zero-emission bus.

![NOx Reductions by Bus Technology (lb/$)](image)

b. Electric Trucks

Similar to electric buses, electric trucks are a smart option for Mitigation Trust funds and have the opportunity to provide great NOx emissions reductions for the state of Utah. Electric medium duty trucks (Class 4-6) are widely used and in active service on the road today. With plummeting battery costs, heavy duty and long haul (Class 7 and higher) electric vehicles are already in pilots and on their way to market. Class 4-7 diesel trucks are eligible for Mitigation Trust funds. These trucks weigh between 14,001 and 33,000 lbs. and include, but are not limited to, delivery trucks, box trucks, beverage distribution trucks, rack trucks, and refuse vehicles.34

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34 The Partial Consent Decree allows funding for Class 4-7 Local Freight Trucks with model years 1992-2006 unless state regulations already require upgrades to 1992-2006 model years. For a description of truck classes see Oak
i. Electric trucks are already in use by businesses across America.

Staples, Frito-Lay, FedEx, UPS, and Coca-Cola are a few of the private firms that have successfully integrated on-road medium size electric trucks into their fleets. Electric medium trucks are available from Smith Electric, ZeroTruck, Boulder Electric Vehicle, EVI-USA, and Freightliner Customer Chassis Corp.35 These companies offer a number of configurations, primarily for localized/urban (so-called “last mile”) delivery and goods/refuse hauling.36 Because of limited battery range—typically a 100-mile maximum—today’s electric medium duty trucks are most effectively deployed in urban or short haul settings.37

Larger auto manufacturers are also developing these technologies to meet both growing market demand and environmental regulations. Mercedes recently unveiled its Urban eTruck concept38 as well as its first fully electric heavy-duty truck.39 Tesla has similarly indicated its intention to apply its all-electric technology to the heavy-duty truck market.40 Both companies are focusing on larger Class 7/8 Heavy Duty trucks, meaning that the technology may become available within the ten-year lifespan of the Mitigation Trust.

ii. Electric trucks save money compared to their diesel counterparts.

Converting to electric medium trucks makes economic sense. A 2013 study placed the total cost savings of electric versus diesel truck ownership at 22%.41 That study assumed a cost premium of $25,000 to $37,000 for electric compared to diesel trucks. Notably, since that study was published, battery prices have dropped from $625/kWh, the value used in the study, to under $200/kWh.42 Because the up-front cost of an electric truck is significantly influenced by the cost

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37 Id.
42 John Voelcker, Electric-car battery costs: Tesla $190 per kWh for pack, GM $145 for cells, Green Car Reports, Apr. 28, 2016, http://www.greencarreports.com/news/1103667 electric-car-battery-costs-tesla-190-per-kwh-for-pack-gm-145-for-cells. The decreases have not been as significant for larger electric vehicles which rely on a different battery chemistry than electric passenger vehicles. See California Air Resources Board, Technology Assessment: Medium and Heavy-Duty Battery Electric Trucks and Buses, Draft, V-3 (Oct. 2015).
of the battery pack, the study likely understates current lifetime cost savings of switching to electric trucks.

Electric delivery trucks also offer significant savings in fuel and maintenance costs as compared to diesel vehicles. Fuel cost savings from switching to electric trucks are tremendous. For example, diesel costs between $2-3 per gallon\(^{43}\) and “last mile” diesel vehicles are extremely inefficient: the average fuel economy ranges from 4.6 MPG to 9.6 MPG depending on route characteristics.\(^{44}\) Electricity prices average approximately $1.29 per gallon of diesel equivalent, though prices vary by region and electric utility provider. Electric delivery trucks average between 16.7 MPGe and 34.3 MPGe for those same routes.\(^{45}\)

These improvements in efficiency add up to significant real world savings in fuel and maintenance costs. EVI estimates that the owner of an electric Class 6 truck should expect to spend only $2,022 per year on electricity while the owner of a similar model diesel vehicle would spend $6,036 on diesel at current prices. Over a projected ten-year lifespan, the cost savings are even greater with an electric vehicle requiring only $17,901 of electricity versus $144,632 spent to fuel a diesel truck.\(^{46}\)

Electric trucks also save significant maintenance costs over their lifetime. For example, a diesel “last mile” truck registers maintenance costs around $0.22/mile.\(^{47}\) These costs include oil changes, break repairs, belt replacements, and regular inspections. An electric delivery truck, by contrast, costs only $0.056-$0.111/mile.\(^{48}\) Electric trucks simply have fewer parts to replace and repair. Additionally, electric drive trains and regenerative breaking reduce wear and tear on remaining parts like brake pads. Because delivery trucks make frequent stops and travel in congested urban areas, brakes are historically one of the most frequent and expensive costs. With electric drive trains break repairs can be reduced by 20-30%.\(^{49}\)

iii. Electric trucks reduce air pollution.

Diesel powered class 4-7 trucks emit, on average, between 4.35 and 7.47 grams of NO\(_x\) per mile traveled.\(^{50}\) Electric vehicles have zero tailpipe emissions. Converting to electricity therefore has a significant impact on local air pollution. Additionally, from a well-to-wheels perspective, electric delivery trucks can reduce greenhouse gas emissions by 27-61%, and they keep improving their environmental performance as our electricity grids get cleaner and cleaner.\(^{51}\)

\(^{43}\) Average national price as of October 3, 2016 was $2.389/gallon, but varies greatly with underlying crude oil prices, see [http://www.eia.gov/petroleum/gasdiesel/](http://www.eia.gov/petroleum/gasdiesel/).

\(^{44}\) Electric Urban Delivery Trucks, supra note 9 at 8027.

\(^{45}\) Id.

\(^{46}\) Cost estimates from First Priority GreenFleet assuming national average diesel price of $2.57/gallon and electricity $0.12/kW h.

\(^{47}\) Id. at 8025.

\(^{48}\) Id.

\(^{49}\) Id.


\(^{51}\) Electric Urban Delivery Trucks, supra note 9 at 8028-29. This variation depends on the operational characteristics of the diesel truck being replaced. If a diesel truck runs a small route and uses less fuel/day then there are less GHGs to reduce. Id.
Lots of pollution from class 4-7 trucks stems from their unique operational requirements. Many of these vehicles register significant idling times, during which they continue to pollute without any additional vehicle miles traveled. A diesel truck uses between 0.40 and 0.85 gallons of diesel per hour of idling. This costs operators money and contributes to air pollution. To address this issue from long-haul trucks states have electrified truck stops. However, this has not addressed the issue of idling in the local freight and parcel delivery fleets. It is important to address these emissions because they have a tendency to occur in populated urban and suburban settings. Electric vehicles can idle without emitting, and have more efficient start-up/shut-down abilities that may further reduce the need to idle.

c. Electric School Buses

Electric school buses present a unique and practical opportunity to reduce NOx emissions. Regrettably, children are often the most exposed and most vulnerable to diesel emissions from school buses. Children are exposed to diesel fumes while riding and getting on and off diesel school buses. Asthma, which diesel pollution exacerbates, is now the most common chronic condition among U.S. children, affecting 1 in 10 in the United States.

Eliminating school bus tail pipe emissions by going electric can help reduce both children’s risk of developing debilitating respiratory diseases and being subjected to exacerbations of chronic lung disease like asthma. These buses are also a practical end use for transportation electrification: electric school bus pilot projects currently underway in Massachusetts suggest additional cost saving opportunities such as the ability to serve as a backup source of power (vehicle-to-building technology) and to sell electricity back to the grid when the vehicles are not in use, as school buses generally sit idle during the peak demand hours of the day and throughout the summer (vehicle-to-grid technology).

The purchase price of electric school buses is currently about three times that of conventional buses ($300,000 versus $100,000). However, as with electric transit buses, the purchase price of these buses will continue to fall in future years as vehicle and battery prices drop. Moreover, present-day O&M savings are not exclusive to transit buses. Electric school buses are in use by a number of municipalities throughout the country and are ideal fits for electrification. Buses typically operate two shifts each day, once in the morning and again in the afternoon. Down time

53 Id. at 124.
54 http://www.lungchicago.org/site/files/487/54230/212503/755739/Asthma_in_Chicago_.pdf
55 A landmark US study has also linked diesel exhaust exposure to lung cancer. https://www.ncbi.nlm.nih.gov/pubmed/22393207
56 https://www.boston.com/cars/cars/2016/11/30/concords-electric-school-bus-is-leading-the-clean-energy-charge
57 http://www.hybridcars.com/lion-bus-unveils-electric-school-bus-blue-bird-to-follow/
between shifts allows buses to fully recharge. In King County, California, two electric school buses were estimated to save roughly 16 gallons of fuel per bus per day. This amounted to an annual fuel saving of over $11,000 per bus.\textsuperscript{59}

IV. DEQ should ensure that it dedicates sufficient funding for program administration as part of its environmental mitigation plan.

The VW Advisory Committee proposes to dedicate five percent of the EMT funds to the administration of Utah’s Environmental Mitigation Plan. The terms of the EMT permit an administering agency to claim up to 15 percent of funds for administrative overhead, in combination with that incurred by third party contractors.

We appreciate that the recommendation has been made to limit administrative costs to five percent, but encourage DEQ to closely assess its potential needs, including technical support, to ensure the Department has the necessary capacity to oversee the program, particularly one that includes management of grants for newer vehicle technology types, EV charging infrastructure, and the creation of superior off road and non-road vehicle emissions inventories, which we strongly urge DEQ to pursue. We believe that the DAQ should be entrusted to spend up to the 15\% funding available for administrative oversight at their discretion.

V. Conclusion

Sierra Club thanks DEQ for the opportunity to submit these comments. We look forward to continued work with the Department and other stakeholders to support forward-looking, transformative, cost-effective use of the Volkswagen EMT in Utah that meaningfully reduce NOx and other polluting emissions from Utah’s transportation sector.

Respectfully submitted,

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E-mail: ashley.soltysiak@sierraclub.org

## Appendix A: AFLEET Inputs and Sources for Transit Bus Analysis

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