March 7, 2019

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RE: Comments Regarding Philadelphia's Use of Volkswagen Environmental Mitigation Trust Funds

These comments are written on behalf of Philadelphia Climate Works, a labor-community coalition in Philadelphia advocating for local policies that reduce carbon emissions by creating high-quality jobs and tangible social benefits for a diverse and growing number of impacted constituencies. We'd like to thank the Office of Sustainability for its work to take advantage of opportunities to reduce carbon emissions reductions in Philadelphia, and for its continued work to engage impacted stakeholders like ours on issues impacting our communities. We hope that this letter, and the resources and data included will encourage the Office to adopt the following priority uses of Volkswagen Environmental Mitigation Trust Funds to achieve a full electrification goal that is both forward-looking and equitable in its approach.

The Environmental Mitigation Trust ("EMT") presents Philadelphia with a unique opportunity to reduce NOx and other polluting emissions to the benefit of all Philadelphia residents, and to accelerate the transition of our transportation sector towards cleaner, more cost-effective vehicles, which will both improve air quality and help drive economic growth. Philadelphia should ensure that investments made through EMT funds are forward looking, advance racial and environmental justice for workers and residents in overburdened neighborhoods, and generate long-term energy savings, while meaningfully reducing NOx and other polluting emissions.

EMT provides an especially critical opportunity for communities disproportionately impacted by environmental degradation. As a member city of Climate Mayors[1] and the Chicago Climate Charter,[2] Philadelphia has committed to taking on climate change. Through Racial Equity Here, Philadelphia has likewise committed to facing and dismantling "institutional and structural barriers that have held back many of [Philadelphia's] racially and ethnically diverse

[1] Members, Climate Mayors, https://www.racialequityalliance.org/jurisdictions/philadelphia-pennsylvania/.
[2] Chicago Climate Charter, *available at* https://www.cityofchicago.org/content/dam/city/depts/mayor/Press%20Room/Press%20Releases/2017/December/ChicagoClimateCharter.pdf.

residents for far too long."[3] The following recommendations are designed to do both. EMT funds present the opportunity to mitigate harms disproportionately suffered by low-income residents, and communities of color, in order to better share the benefits of cleaner air and increased economic growth with all Philadelphians.

To maximize the impact of EMT funds in achieving these goals, we offer the following recommendations:

- Philadelphia should use mitigation funds to create a pilot program to begin the process of replacing diesel garbage trucks with all-electric garbage trucks.
- Philadelphia should prioritize the transformation of SEPTA by using funds to replace diesel transit buses with all-electric buses.
- Philadelphia should prioritize funding EV charging infrastructure and maximize the 15% available for such purposes. In particular, "long dwell time" locations should be prioritized for installation of Level 2 charging, like multi-unit dwellings and workplaces, particularly in disadvantaged communities. DCFC charging, also known as Fast Charging, should also be prioritized along major corridors where gaps currently exist.
- Philadelphia should support the electrification of infrastructure at the Port of Philadelphia and the airport.

We explain each recommendation in more detail below:

I. Philadelphia Should Fund Electric Garbage Trucks

Philadelphia should use EMT funds[4] to replace diesel powered garbage trucks with electric vehicles.

A. Electric Sanitation Trucks Reduce Toxic Exposures Impacting Workers and EJ Communities

Diesel pollution from sanitation trucks has devastating impacts on the health of workers and the communities they're released into, impacting children, low income residents, and communities of color that typically live closer to transfer stations.

Sanitation workers experience direct health impacts from working on diesel sanitation trucks. On average, studies on long-term occupational exposure to diesel pollution indicate a that there is a 40% increase in risk of lung cancer for truck drivers, railroad workers, and heavy equipment operators, like sanitation workers.[5] The City of Philadelphia employs 749 sanitation

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[3] Local & Regional Government Alliance on Race & Equity, "East Racial Equity Here Core Member: Philadelphia, Pennsylvania," https://www.racialequityalliance.org/jurisdictions/philadelphia-pennsylvania/.

[4] The funds are available for 100% of the cost of repowering or replacing government-owned vehicles with all-electric motors or infrastructure. *See* Partial Consent Decree, *In re: Volkswagen "Clean Diesel" Marketing, Sales, Practices, and Products Liability Litigation,* Case No.: MDL No. 2672 CRB (JSC) at Appendix D-2 (N.D. Cal. June 28, 2016).

[5] Alan C. Lloyd & Thomas A. Cackette (2001) "Diesel Engines: Environmental Impact and Control", *Journal of the Air & Waste Management Association*, 51:6, 809-847, DOI: 10.1080/10473289.2001.10464315, https://doi.org/10.1080/10473289.2001.10464315

workers, 95% of whom are people of color[6], placing a disproportionate risk on workers of color from the impacts of diesel emissions.[7] Electric sanitation trucks eliminate the health hazards associated with diesel fumes and emissions, directly improving the lives and well-being of the workers operating the trucks. The City should also move forward with an electric sanitation truck pilot program that includes a study on the impact of an electric trash truck fleet transition on workforce designed in collaboration with AFSCME District Council 33.

Electric sanitation trucks can also reduce the toxic exposure of our most vulnerable communities, like children and low-income and communities of color living in environmental justice areas. Recent studies also show that children living on neighborhood streets with diesel truck traffic show statistically significant associations of asthma, allergy, and respiratory symptoms.[8] Furthermore, diesel powered sanitation trucks present an environmental justice concern because traffic from sanitation trucks is usually concentrated at waste transfer stations. The US EPA reported that waste transfer stations are disproportionately located in low-income neighborhoods and communities of color, often resulting in these community members experiencing negative health impacts from diesel exhaust. Out of ten waste transfer stations in Philadelphia[9], seven of those waste transfer stations are located in environmental justice areas in North, Northwest, Northeast, Southwest, and South Philadelphia, as confirmed by PA DEP's Environmental Justice Areas Viewer.[10] Electric sanitation trucks can eliminate one of the burdens impacting our most vulnerable Philadelphia residents.

B. Electric Sanitation Trucks Offer A Cost-Effective and Clean Solution

Aside from the numerous social and health benefits, electric sanitation trucks offer a cost-effective way for Philadelphia to reduce NOx emissions and other pollutants. Other cities like Los Angeles,[11] Chicago,[12] Sacramento,[13] and Palo Alto[14] have purchased all-electric garbage trucks to take advantage of a cleaner, quieter, and cheaper way to collect trash.

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[6] Tom Ferrick Jr, "White-collar, black-collar: Philly's public-sector divide Part II," PHILLY.COM, 2015, http://www.philly.com/philly/news/politics/mayor/Part_2_Local_government_workforce_breakdown.html.
[7] Tom Ferrick Jr, "White-collar, black-collar: Philly's public-sector divide Part I," PHILLY.COM, 2015, http://www.philly.com/philly/news/politics/mayor/Local_government_workforce_breakdown.html.
[8] Alan C. Lloyd & Thomas A. Cackette (2001) "Diesel Engines: Environmental Impact and Control", *Journal of the Air & Waste Management Association*, 51:6, 809-847, DOI: 10.1080/10473289.2001.10464315, https://doi.org/10.1080/10473289.2001.10464315
[9] "Municipal Waste Transfer Stations," PA DEPARTMENT OF ENVIRONMENTAL PROTECTION, http://files.dep.state.pa.us/Waste/Bureau%20of%20Waste%20Management/WasteMgtPortalFiles/SolidWaste/Municipal_Waste/mwts.xls
[10] "Environmental Justice Areas Viewer," PA DEPARTMENT OF ENVIRONMENTAL PROTECTION, http://padep-1.maps.arcgis.com/apps/webappviewer/index.html?id=f31a188de122467691cae93c3339469c.
[11] "Motiv to Deliver Electric Refuse Trucks by Early 2018," TRUCKINGINFO, Oct. 9, 2017, http://www.truckinginfo.com/channel/fuel-smarts/news/story/2017/10/motiv-to-deliver-electric-refuse-trucks-by-early-2018.aspx.
[12] Adele Peters, "North America's First Electric Garbage Truck Is Silently Driving Chicago Streets," FAST COMPANY, Oct. 3, 2014, https://www.fastcompany.com/3036432/north-americas-first-electric-garbage-truck-is-silently-driving-chicago-streets.
[13] Randol White, "Sacramento Buying California's First All-Electric Garbage Truck," CAPITAL PUBLIC RADIO, June 13, 2017, http://www.capradio.org/articles/2017/06/13/sacramento-buying-californias-first-all-electric-garbage-truck/.
[14] Gennady Sheyner, "Palo Alto Goes Electric With Refuse Truck," Palo Alto Online, Nov. 21, 2017, https://www.paloaltoonline.com/news/2017/11/21/palo-alto-goes-electric-with-refuse-truck.

Washington, DC plans to purchase an electric garbage truck with its VW funds.[15] While new compressed natural gas (CNG) garbage trucks may be an improvement over older diesel trucks, all-electric trucks offer the only option to achieve zero tailpipe NOx, PM, VOC and GHG emissions. These trucks also significantly reduce annual fuel and maintenance costs, which could free the City to make investments elsewhere. Diesel trucks have an average fuel economy of about 3.6 MPG, whereas electric trucks can average between 16.7 MPGe and 34.3 MPGe for same routes.[16] The City could reduce annual fuel costs with electric sanitation trucks significantly--over a 10-year lifespan, diesel trucks can cost over $144,000, while electricity for electric trucks cost an estimated $17,901 over a 10-year lifespan.[17] Similarly, electric trucks reduce maintenance costs from having fewer parts to repair and replace, and their electric drive trains and regenerative breaking reduce wear and tear on remaining parts, like brake pads. To compare, diesel "last mile" truck maintenance costs average to $.22 per mile, including oil changes, break repairs, belt replacements, and regular inspections, and electric trucks maintenance costs ranges from $.056-$.111 per mile.[18]

Electric garbage trucks offer the cleanest way to pick up trash. Diesel powered class 4-7 trucks emit, on average, between 4.35 and 7.47 grams of NOx per mile traveled.[19] CNG garbage trucks emit significant amounts of PM2.5, PM10, and VOC, and they emit substantially more carbon monoxide than diesel trucks.[20] Electric vehicles have zero tailpipe emissions. Converting to electricity therefore has a significant impact on local air pollution, creating healthier neighborhoods and safer working conditions for everyone.

II. Philadelphia Should Expend Funds on Electric Transit Buses

Philadelphia should prioritize the electrification of its SEPTA bus fleet. Electric buses may present marginally higher up-front costs, but they provide substantial long-term savings relative to conventional, hybrid and CNG buses over their lifetime of use. Purchasing zero-emission electric buses represents the most cost-effective way to reduce NOx levels. Furthermore, zero-emission electric buses can also reduce the amount of diesel pollution impacting workers and environmental justice communities. The EMT funds provide Philadelphia

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[15] Dep't of Energy and Env't, District's Draft Spending Plan for Volkswagen Settlement Funds (Draft Beneficiary Mitigation Plan), *available at* https://doee.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/The%20District%27s%20Draft%20Spending%20Plan%20for%20Volkswagen%20Settlement%20Funds%20%28Draft%20Beneficiary%20Mitigation%20Plan%29.pdf.

[16] "VW Electric Truck Fact Sheet" SIERRA CLUB, https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/new-jersey-chapter/Handouts/VW_Electric_Truck_Factsheet.pdf

[17] Cost estimates from First Priority GreenFleet assuming national average diesel price of $2.57/gallon and electricity $.12/kWh.

[18] "VW Electric Truck Fact Sheet" SIERRA CLUB, https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/new-jersey-chapter/Handouts/VW_Electric_Truck_Factsheet.pdf

[19] U.S. EPA Office of Transportation and Air Quality, Average In-Use Emissions from Heavy-Duty Trucks, Oct. 2008, 5 https://www3.epa.gov/otaq/consumer/420f08027.pdf

[20] Garbage trucks traveling an average of 14,500 miles per year would emit 18,865 lbs carbon monoxide (significantly more than diesel trucks' 506 lbs), 127 lbs PM10 (same as diesel), 34 lbs PM2.5 (same as diesel), and 41 lbs VOC (a diesel truck emits 79 lbs VOC). Metrics derived from Argonne National Laboratory's AFLEET Model (2017) and ZEB transit studies. 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.

the ideal chance to make a sound investment that will provide enormous economic and health benefits for years to come.

A. Zero-Emission Buses Reduce Toxic Exposures Impacting Workers and EJ Communities

Diesel exhaust contains more than 40 toxic air contaminants that cause and/or worsen diseases such as asthma and cancer. Impacted workers (bus drivers, bus garage mechanics), low-income communities, and communities of color face higher health risks from frequent exposure to diesel exhaust.

Converting SEPTA's diesel and hybrid-diesel buses should be prioritized as a workplace safety solution because diesel exhaust creates an occupational hazard for workers who repair buses, work in bus depots, or operate buses. There are several studies that have measured diesel pollution exposure levels in workers and linked heightened exposure to negative respiratory issues including burning eyes, headaches, difficult or labored breathing, nausea, and wheeze.[21] One study ranked workers' levels of exposure to black carbon and found that bus garage mechanics, followed by bus drivers and bus garage attendants faced higher risks of the abovementioned health symptoms.[22] Long term exposure to high concentrations of diesel exhaust can lead to increased risk of cardiovascular, cardiopulmonary and respiratory disease, and lung cancer; in June, 2012, the International Agency for Cancer Research (IARC) classified diesel exhaust as a known human carcinogen.[23]

These risks place a disproportionate risk on people of color. Out of SEPTA's 2,427 bus operators, 85% are people of color.[24] Similarly, the brunt of diesel emissions from bus depots are concentrated in environmental justice communities, impacting residents who are low-income and/or people of color. For example, several main bus depots and transportation centers are located in environmental justice areas, including Frankford Transportation Center, Olney Transportation Center, Midvale bus depot, Callowhill bus depot, and Allegheny bus depot.[25] These neighborhoods (measured in a 1 square mile region around the transit centers) show elevated levels above the State average, US EPA region average, and the US average for diesel particulate matter, and heightened risks for cancer and respiratory hazards, according to the EPA's National-Scale Air Toxics Assessment. Some of these areas, namely the Allegheny and Midvale bus depots, Frankford Transportation Center and Olney Transportation Center are also in proximity to Hazardous Waste Treatment, Storage and Disposal Facilities.[26] These areas

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[21] Pronk, Anjoeka, Joseph Coble, and Patricia Stewart. "Occupational Exposure to Diesel Engine Exhaust: A Literature Review." Journal of exposure science & environmental epidemiology 19.5 (2009): 443–457. PMC. Web. 20 Sept. 2018.

[22] Gamble J, Jones W, Minshall S. Epidemiological-environmental study of diesel bus garage workers: acute effects of NO2 and respirable particulate on the respiratory system. Environ Res. 1987;42(1):201–214. https://www.sciencedirect.com/science/article/pii/S0013935187800221

[23] "HAZARD ALERT - Diesel Exhaust/Diesel Particulate Matter," Occupational Health and Safety Administration, UNITED STATES DEPARTMENT OF LABOR, https://www.osha.gov/dts/hazardalerts/diesel_exhaust_hazard_alert.html

[24] Tom Ferrick Jr, "White-collar, black-collar: Philly's public-sector divide Part II," PHILLY.COM, 2015, http://www.philly.com/philly/news/politics/mayor/Part_2_Local_government_workforce_breakdown.html.

[25] "Environmental Justice Areas Viewer," PA DEPARTMENT OF ENVIRONMENTAL PROTECTION, http://padep-1.maps.arcgis.com/apps/webappviewer/index.html?id=f31a188de122467691cae93c3339469c.

[26] "Environmental Justice Areas Viewer," PA DEPARTMENT OF ENVIRONMENTAL PROTECTION, http://padep-1.maps.arcgis.com/apps/webappviewer/index.html?id=f31a188de122467691cae93c3339469c.

are overburdened with sources of toxic pollution, so this opportunity to reduce exposure with EMT funds should be prioritized.

While we recognize the importance of having these key transit centers in neighborhoods, especially ones with low-income residents and residents of color, increased mobility and access to transit should not come with a trade-off as severe as the health impacts associated with diesel pollution. Likewise, the City should take advantage of EMT funds to protect workers who serve their communities as bus drivers, and bus maintenance and depot workers from toxic exposure to diesel pollution. SEPTA should begin a transition to an all-electric bus fleet with a study to determine which routes to prioritize based on the length of the bus routes and estimated NOx reductions, and whether the neighborhoods the buses run through are environmental justice areas.

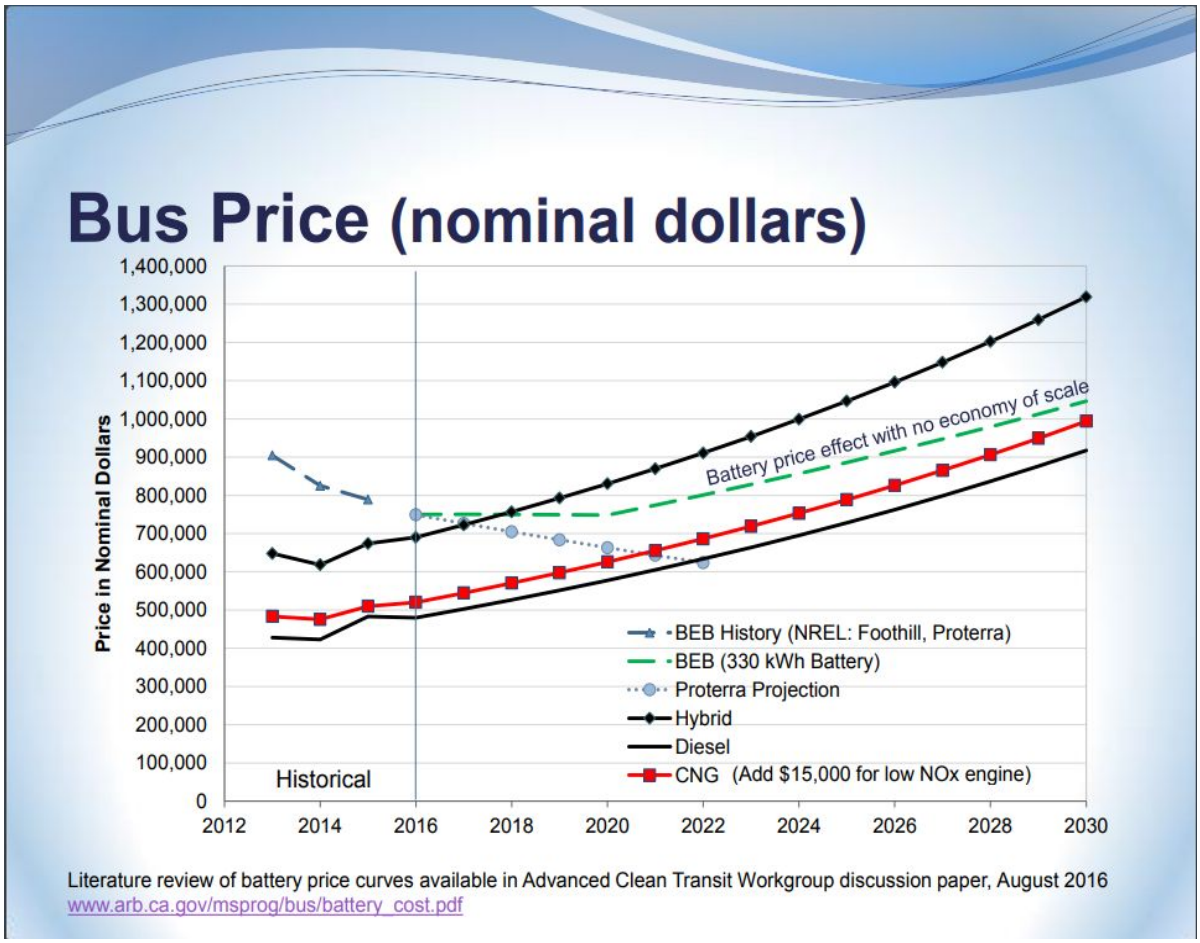
B. Zero-Emission Buses Are Cheaper Than Conventional Buses

Despite their greater purchase price, current analysis using Argonne National Laboratory's AFLEET Model demonstrates that zero emission electric buses have a total cost of ownership 20% 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 Pennsylvania's transit agencies over $250,000 as compared to a new diesel bus purchase.[27]

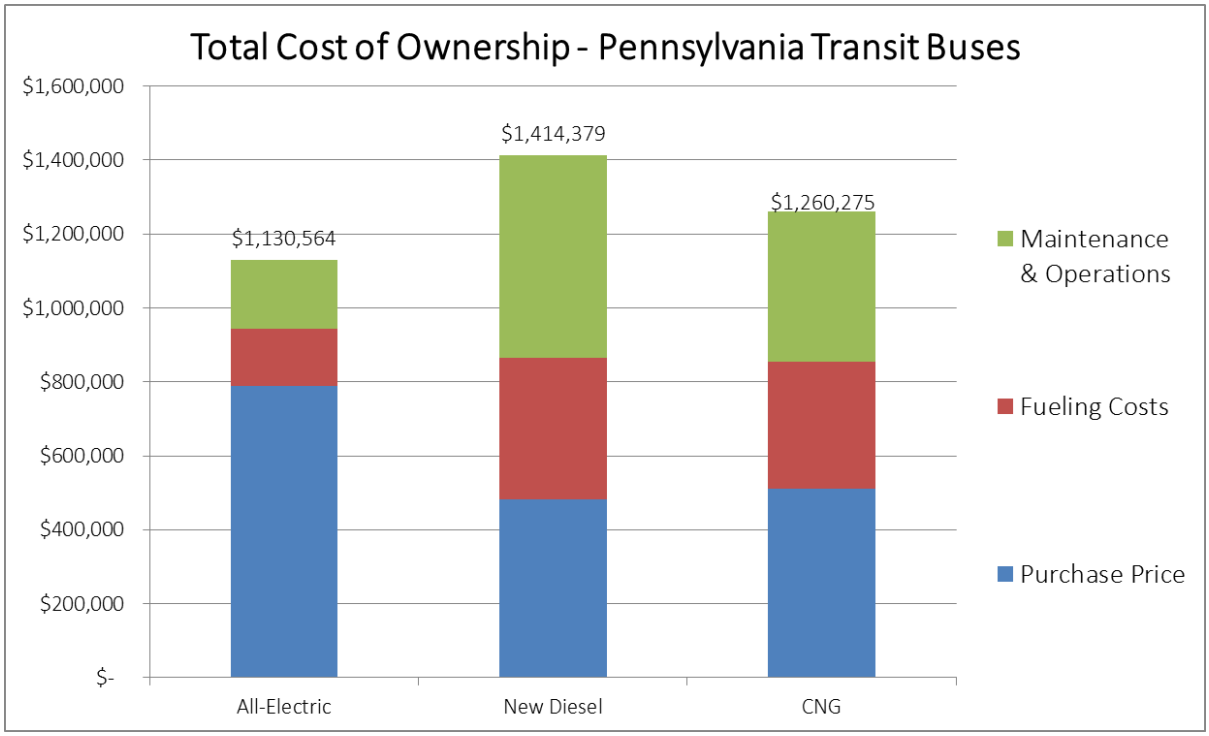
Moreover, as this electric bus technology continues to develop, all-electric bus up-front capital costs will continue to drop, whereas CNG and diesel bus capital cost trends are continually increasing faster than inflation over time--these are mature technologies that are not witnessing the plummeting price declines of disruptive technologies such as ZEBs.[28]

[27] Argonne National Laboratory's AFLEET Model (201);7 fuel and electricity costs adjusted for Philadelphia, Pennsylvania

[28] California Air Resources Board. (2016) T*otal Cost of Ownership to Advance Clean Transit*. Presentation Prepared for the 4th Meeting of the Advanced Clean Transit Working Group. <https://www.arb.ca.gov/msprog/bus/4thactwgmtng_costs.pdf>



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.



Source: Argonne National Laboratory's AFLEET Model (201);7 fuel and electricity costs adjusted for Philadelphia, Pennsylvania

The total cost of ownership is derived from Argonne National Laboratory's AFLEET Model (2017). Fuel prices are adjusted for the Philadelphia, PA 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 'AFLEET Inputs and Sources' attached).

C. Maintenance and Fuel Costs

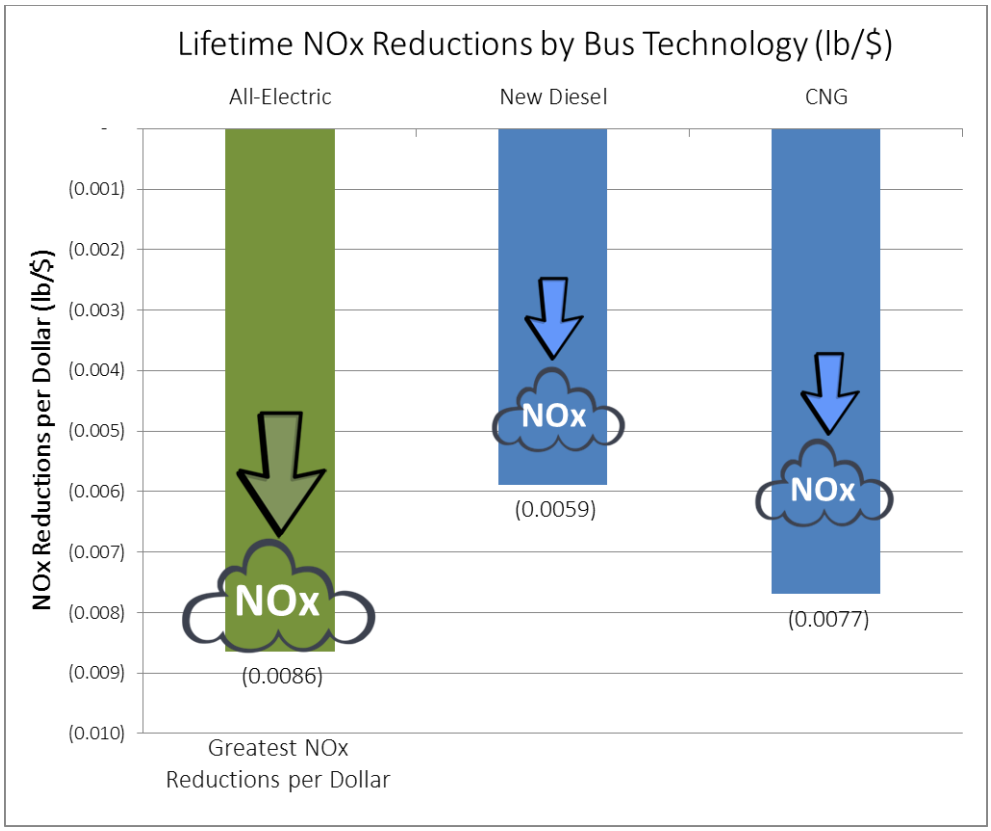
	Fuel Economy (MPGDE)	Maintenance & Repair ($/mi)
Electric	**19.44**	**$0.17**
Diesel	4.16	$0.80
CNG	3.87	$0.56

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.[29] 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.[30]

[29] Metrics derived from Argonne National Laboratory's AFLEET Model (2017) and ZEB transit studies
[30] https://www.afdc.energy.gov/fuels/prices.html

D. NOx Reductions (lb/$)

Specific to the Volkswagen Settlement, agencies are instructed to demonstrate their anticipated NOx reductions as a result of their state's environmental mitigation transportation investments. 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.



III. Philadelphia Should Prioritize Funding EV Charging Infrastructure

Another place to invest EMT funds is in building out Philadelphia's electric passenger, or light duty vehicle ("LDV"), charging infrastructure. Section X of the settlement provides that states can use up to 15% of their total allotted funds to build out charging infrastructure for light duty electric vehicles—provided that the chargers be installed in workplaces and multi-unit dwellings for slower chargers, DCFC "fast chargers" be installed in publicly accessible locations in urban areas and on highways.

Philadelphia should take advantage of the funding opportunity to expand access to chargers in these locations. As discussed below, installing chargers at such locations can play an important role in overcoming those hurdles and bringing the benefits of EVs to the present day. Numerous studies have concluded that the absence of an adequate, existing charging infrastructure for LDV EVs is an impediment to rapidly increasing EV adoption.[31] This is true for several reasons. First, it creates a higher upfront capital cost to an EV user to install a charger. Second, many potential EV owners neither own nor operate a parking space that they can

[31] International Energy Agency, "Technology Roadmap: Electric and Plug-in Hybrid Electric Vehicles," June 2011, available at: http://www.iea.org/publications/freepublications/publication/EV_PHEV_Roadmap. pdf ; UBS Report. See also, National Academy of Sciences ("federal financial incentives to purchase PEVs should continue . . . .").

install a charger in. Third, the lack of a robust charging infrastructure on highways contributes to range anxiety. Fourth, the lack of visible, installed charging infrastructure results in lower public awareness of electric vehicles. Using EMT funds to build out charging infrastructure in appropriate locations can overcome these hurdles, as discussed below.

Philadelphia should choose locations for siting charging infrastructure by prioritizing the following: locations where there is an impediment to the market doing it on its own; locations where parked vehicles have long ”dwell” times; and locations that can effectively increase public awareness. Collectively, these criteria present a strong argument for building LDV EV charging infrastructure in Multi-Unit Dwellings, Workplaces and DCFC in publicly accessible locations in urban areas and on Highways.

A. DCFC: Highways and Publicly Accessible Locations in Urban Areas

EMT funds should be used to build out high speed direct current (“DC”) charging infrastructure on highways. Doing so is critical to resolving range anxiety and increasing public awareness.

More specifically, access to DC fast charging influences consumers’ choices and is therefore an important part of a comprehensive charging network. One critical benefit of DC fast charging is that it enables inter-city and long-distance travel that is otherwise impossible or impractical for all-electric vehicle drivers.[32] In addition to inhibiting distance travel and exacerbating range anxiety, consumer research indicates that a “lack of robust DC fast charging infrastructure is seriously inhibiting the value, utility, and sales potential” of typical pure-battery electric vehicles.[33]

Consequently, increased access to DC fast charging stations must be achieved in order to build an effective EV infrastructure that will drive EV adoption. As with many network industries, the development of DC fast charging networks suffers from a “chicken-or-the-egg” market coordination problem. Prospective EV owners are reluctant to purchase an electric car in the face of limited access to charging infrastructure because the EV’s range and use would be limited. Likewise, prospective hosts and private funders of EV charging infrastructure cannot see a business case for EV charging station investment where too few EVs are in use to provide a return on investment.

The market coordination problem is acute for DC fast charging stations, which have “high upfront costs” and “require significant revenues for the owner-operator to achieve profitability.”[34] However, quantitative research on this “chicken-or-the-egg” problem in the EV context not only indicates that the increased supply of more EVs would drive the deployment of more public charging and vice-versa, but that a financial subsidy given to infrastructure investment will increase EV sales by more than twice the amount of the increase if the financial incentive is provided for EV purchase.[35]

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[32] Nick Nigro et al. *Strategic Planning to Implement Publicly Available EV Charging Stations: A Guide for Businesses and Policymakers* (2015) at 11.

[33] PlugShare*, New Survey Data: BEV Drivers and the Desire for DC Fast Charging* (March 2014).

[34] Nigro, *supra* note 27.

[35] Li S et al, *The Market for Electric Vehicles: Indirect Networks Effects and Policy Design*.

In addition, installing DCFC in publicly accessible locations in urban areas can allow people that do not have access to chargers in their residences to charge up quickly in a convenient location. It can also allow individuals on extended trips through cities to top off.

B. Multi-unit dwellings ("MUDs")

EMT funds should be used to build out charging infrastructure at multi-unit dwellings. Studies have shown that most charging is done at locations with long term "dwell times" during which batteries can recharge, such as homes. The National Research Council of the National Academy of Sciences characterizes home charging as a "virtual necessity" for all EV drivers, and that residences without access to electric vehicle charging "clearly [have] challenges to overcome to make PEV ownership practical."[36] Drivers are very unlikely to purchase an EV if they cannot charge at home.[37]

Unfortunately, many people that live in urban environments do not own or otherwise operate their parking shared space. In fact, research shows that less than half of all vehicles in the U.S. have access to a dedicated off-street parking space at an owned residence where a charging station could be installed by the owner.[38] These include people that live in large multi-unit dwellings and park in garages or parking lots, as well as people that rely on street parking. The industry term for such people is "garage orphans," and they often either lack the ability to install a charger or face serious challenges to doing so. One such study conducted for Eversource Utility in Boston, Massachusetts, found that the garage orphan effect resulted in most EV owners being individuals who live in single family homes, often clustered in more leafy suburban neighborhoods.[39]

Meanwhile, the owner and operator of the garage or parking lot may lack sufficient incentive to spend the capital to install chargers. The investment in charging infrastructure may not be recoverable within the expected tenure of renters. Moreover, costs of charging infrastructure at a distance from the building, such as in a parking lot, will likely be higher than installation in a single-family house.

Philadelphia should use the EMT funds to overcome the unique barriers faced by residents of multi-unit dwellings by using the EMT funds to subsidize the development of charging infrastructure, therefore unlocking the ability for people living in multi-unit dwelling in urban areas to charge their vehicle overnight while they sleep.

C. Workplaces

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[36] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press at 9 (2015).

[37] See Adam Langton and Noel Crisotomo, *Vehicle-Grid Integration*, California Public Utilities Commission at 5 (October 2013).

[38] Traut, Elizabeth et al., US Residential Charging Potential for Electric Vehicles, Transportation Research Part D 25 (November 2013): 139-145.

[39] *Accommodating Garage Orphans in Boston, Cambridge, and Somerville*, by WXY, available at http://wxystudio.com/uploads/1700017/1441308185862/GarageOrphanReport_v2.1_08182015.pdf

EMT funds should be used to build out charging at workplaces. Workplaces offer another location with long dwell times to recharge batteries, and access to electricity fuel at workplaces reduces "range anxiety," improves the EV value proposition, and greatly increases consumer awareness of EVs. Research from the U.S. Department of Energy shows that people that have access to workplace charging are 20 times more likely to be EV owners.[40] Likewise, the National Research Council study also reports that charging at workplaces offers an important opportunity to increase EV adoption and to increase electric miles driven.[41]

D. Disadvantaged and Environmental Justice Communities

In both siting charging infrastructure and in education and outreach, Philadelphia should seek to serve disadvantaged communities. As noted in a 2011 report by The Greenlining Institute, such communities are more heavily impacted by air pollution and are more concerned by it. They are a natural but largely untapped market for EVs.[42] Moreover, as section 5.2.10 of the Settlement Agreement provides, in approving plans states must provide a "description of how the Eligible Mitigation Action mitigates the impacts of NOx emissions on communities that have historically borne a disproportionate share of the adverse impacts of such emissions." Ensuring that multi-unit dwellings and workplaces in disadvantaged and environmental justice communities are provided charging infrastructure is a critical component of any plan to use EMT funds.

IV. Philadelphia Should Fund the Electrification of Port Infrastructure

Philadelphia should use the VW EMT funds to electrify port facilities and airport facilities and achieve resulting reductions in NOx, along with PM and CO2. There are several technologies that we can and should invest in:

First, Philadelphia should invest the funds[43] in "cold ironing" infrastructure." Through cold ironing, large ocean going vessels (OGVs) can be connected to shore-side power while docked (at "berth"). This technology eliminates the need for ships to self-produce electricity while in harbor, a requirement that is typically met by burning heavy bunker fuel in on-board auxiliary boilers.[44] Cold ironing, already in use at large ports like the Port of California,[45] can greatly reduce emissions of NOx, PM2.5, and CO2. Replacing on-board auxiliary power with shore-side electricity reduces per call NOx emissions by 62.1-89.9%; PM2.5 emissions by 62.0-89.4%; and well-to-propeller CO2 emissions by an estimated 22.4-37.6%.[46] Because the auxiliary burners used to self-generate hoteling power burn extremely dirty bunker fuel, these percentages

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[40] U.S. Department of Energy, *Workplace Charging Challenge Progress Update 2014: Employers Take Charge*, 5 (2014), available at: http://www.energy.gov/sites/prod/files/2015/11/f27/WPCC_2014progressupdate_1114.pdf

[41] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press at 9 (2015).

[42] C.C. Song, *Electric Vehicles; Who's Left Stranded?*, The Greenlining Institute at 4 (August, 2011).

[43] Funds may reimburse 100% of the cost of "government owned shore-side investments in cables, cable management systems, shore power coupler systems, distribution control systems, and power distribution." Partial Consent Decree, *supra* note 4, at 5.

[44] U.S. EPA, *National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gases at U.S. Ports*, EPA-420-R-16-011, 84 (Sep. 2016).

[45] Cal. Code Regs. tit. 17, §§ 93118.3, 93118.3(d).

[46] U.S. EPA, *supra* note 38, at 82.

equate to significant reductions in total pollution. Second, funding should be used to speed turnover of the short-haul (drayage) fleet from diesel vehicles to zero emission electric alternatives.[47] These technologies are already being successfully integrated into operations at several ports. In California's San Pedro Bay Ports, investment in clean drayage technology reduced truck air emissions over 95% from 2005-2012.[48] Third, funding is available to invest in electric forklifts.[49] Diesel forklifts are heavy emitters of local air pollution. Replacing these models with zero-emission electric alternatives eliminates tailpipe emissions and presents significant long-term cost savings, despite greater up-front cost.[50] Today, electric forklifts are commercially available and have been widely adopted to replace their diesel counterparts.

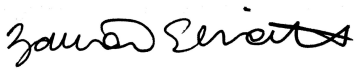
Philly can also utilize funds for airport vehicles. This can include buses, trucks and other land based equipment. Georgia for example has included funding for replacing airport buses with ZEBs. The electrification of port and airport facilities can greatly reduce local air pollution and air quality burdens on workers directly operating the equipment, infrastructure and vehicles, creating a safer worksite and a healthier environment for Philadelphia.

V. Conclusion

In summary, Philadelphia should make the following key investments with Volkswagen EMT funds: Philadelphia should create a pilot program to begin the process of replacing diesel garbage trucks with all-electric garbage trucks; prioritize the transformation of SEPTA by using funds to replace diesel transit buses with all-electric buses; advance the development of EV charging infrastructure and maximize the 15% available for such purposes; and support the electrification of infrastructure at the Port of Philadelphia and the airport.

We thank the Office of Sustainability for the opportunity to engage and submit these comments. We look forward to continued engagement of the agency with us and other stakeholders to promote forward looking, transformative, and environmentally friendly use of the Volkswagen EMT funds in Philadelphia. Again, this opportunity is a rare chance to stimulate a sustainable, cost-effective, long-term strategy for our city's transportation sector, especially in an age that demands environmental justice and climate solutions more than ever. We urge you to actively advance electrification.

Respectfully submitted,



Zakia Elliott, Coordinator
Philadelphia Climate Works

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[47] Drayage trucks are often retired long-haul vehicles, and a 2011 EPA study estimated that the majority were pre-1997 models. *See id.* at tbl. 5-6. EPA's emission standards for pre-2004 trucks allowed more than four grams of NOx/bhp-hr, a rate that has since been lowered to .2 g/bhp-hr. *See* U.S. EPA, *Emission Standards Reference Guide*, available at https://www.epa.gov/emission-standards-reference-guide (last visited Sep. 29, 2016).

[48] Gunwoo Lee, et al., *Assessing Air Quality and Health Benefits of the Clean Truck Program in the Alameda Corridor: CA Transportation Research Plan Part A*, 46 Policy and Practice 8, 1177-93 (Oct. 2012).

[49] Funds are available for 100% of the cost of governmental purchases of electric forklifts over 8,000 lbs. See Partial Consent Decree, *supra* note 4, at 7-8.

[50] Electric Power Research Institute, *Lift Truck Comparison with Capital Costs*, http://et.epri.com/Calculators_LiftTruckComparison_with_cap2.html (last visited Sep. 30, 2016).