



October 4, 2017

Ms. Lisa Williams
California Air Resources Board, Mailstop 5B
P.O. Box 2815
Sacramento, California 95812-2815

Subject: Developing the California Volkswagen Beneficiary Mitigation Plan

Ms. Williams,

Thank you for requesting and considering these comments regarding the development of California's VW Beneficiary Mitigation Plan.

The detailed comments in this document are organized in the framework provided for CARB's upcoming public workshop and include: Guiding Principles, Process for Administering Projects, Benefits to Low-Income and Disadvantaged Communities, and Eligible Mitigation Action Categories to Consider.

In this letter we provide broadly applicable recommendations and emissions information, along with data and requests that are specific to yard trucks. When developing California's Volkswagen Beneficiary Mitigation Plan, please ensure that:

- 1) All components of yard truck projects (trucks, charging, and infrastructure) are individually eligible for funding under one project umbrella,
- 2) Electric yard truck projects are funded at the maximum allowable, and
- 3) Yard trucks in all operating environments are eligible for funding.

Thank you for your consideration and continued partnership in the mission to deploy emission-free technologies.

A handwritten signature in black ink that reads "Michael R. Saxton".

Respectfully,
Mike Saxton
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Background

Orange EV manufactures heavy-duty (Class 8) pure-electric terminal trucks also known as yard trucks, drayage trucks, hostlers, spotters, and more - they can all refer to the same vehicle. Yard truck replacements/repowers are ideal VW mitigation projects given that retiring just one diesel engine typically results in calculated NOx emissions reductions of 1-2 tons per year depending on usage, and real-world reductions may be far greater. New studies have shown that diesel emissions control devices do not operate as designed at lower speeds; since yard trucks operate under 25 mph and often 10-15 mph, they lie squarely in the worst-case scenario for diesel emissions control systems.

Orange EV provides the first - and still only - commercially deployed Class 8, 100%-electric vehicles. The trucks have been commercially deployed since 2015, and most fleet customers have required incentive funding to offset higher up-front capital costs and to overcome the perceived "risk premium" associated with newer technology and the cost of change that comes with testing and deploying new equipment. Orange EV trucks meet the demands of even the harshest environments (e.g. Chicago rail intermodal) and 75% of fleet customers have re-ordered within 6 months of receiving their first truck. The hurdles remain, however, and to accelerate deployment of heavy duty electrics, significant incentives are required.

Guiding Principles

The following list is not exhaustive but provides a framework for the decision and planning processes. California's Volkswagen Beneficiary Mitigation Fund Plan should:

- 1) Support projects to accelerate and/or enhance commercial adoption of zero-emission vehicles.
- 2) Augment existing private and public incentives and grants at a project level.
- 3) Focus investment in locations to benefit disadvantaged communities.
- 4) Demonstrate sustainability of zero emission fleets and projects.
- 5) Avoid interfering with or undermining emerging and existing businesses.
- 6) Encourage innovation and speed-to-market for additional zero emission vehicles.
- 7) Incent users to transition fleets more quickly.

Process for Administering Projects

The Volkswagen Beneficiary Mitigation Plan provides a rare opportunity to fund projects in a way that is complementary and additional to current California programs. Currently, Carl Moyer is one of the most successful programs for heavy duty yard trucks funding up to 85% of truck cost, but has limitations in that it cannot address the complex tapestry of ownership and operations associated with third party logistics and yard management companies.

Fund multiple projects under one umbrella

Due to the typical business models utilized in freight handling, there are frequently several parties paying for different aspects of one project. Quite often, yard trucks are owned by a yard management company who has a contract to move freight at a customer site. When moving to all-electric, the yard management company purchases the vehicles, while the facility



or site owner is responsible for utility costs as well as the cost of installing infrastructure and charging equipment. For a project to move forward, all parties must work together and agree to individual costs. For the business case to make sense for all parties, all components of the project - vehicle acquisition, charging, and infrastructure - must be eligible for incentive funding.

To address this all-too-common scenario, please create a funding structure that allows for multiple contracts (with multiple entities) under one project umbrella. This unique approach will remove roadblocks, incent all parties who shoulder project costs, and speed adoption of zero emission vehicles.

Fund electric projects at the maximum allowable

For Class 8 all-electric solutions, the Volkswagen trust agreement allows up to 75% of the project to be funded for private fleets and 100% for public; this funding applies to repower or replacement projects and includes charging and infrastructure. To accelerate deployments of heavy duty electrics and to achieve cost parity, incentive amounts should be set at this maximum allowable. These benefits should also allow for augmentation by other private or public funding programs.

Cost parity vs. emissions parity

The following table provides a comparison of Orange EV yard truck acquisition costs vs. the cost of a Tier 4 diesel refurbishment, and also highlights the incentive level required to achieve cost parity. What the data doesn't quantify is the "emissions parity" or perhaps better the "emissions advantage" delivered with zero-emission projects. When a pure electric vehicle replaces a diesel, emissions are completely eliminated (i.e. there are no Tier 4 emissions) and the emissions advantage is permanently captured.

When analyzing the table, it's important to note that in most cases fleets are not looking to buy a new Tier 4 diesel, but rather extend the life of a current truck or buy a refurbished vehicle that meets emission standards. The purchase decision boils down to three alternatives: 1) use incentives to move quickly and purchase a pure-electric vehicle; 2) purchase an acceptable refurbished diesel; or 3) wait until the normal replacement cycle to purchase a new Tier 4 diesel.



Basic Cost Comparison: Orange EV Pure-Electric Terminal Truck Solution vs. Diesel

Costs	REPLACEMENT		REPOWER	
	NEW Extended Duty (160kWh) w/Fast Charge Cabinet	NEW Extended Duty (160kWh) w/Standard Onboard Charging	REMAN Extended Duty (160kWh) w/Fast Charge Cabinet	REMAN Standard Duty (80kWh) w/Standard Onboard Charging
Orange EV truck, base price ¹	\$284,950	\$284,950	\$239,950	\$199,950
Orange EV charging	\$49,950	\$0	\$49,950	\$0
Electrical infrastructure ²	\$20,000	\$6,000	\$20,000	\$6,000
Taxes (estimated 8%)	\$28,392	\$23,276	\$24,792	\$16,476
Total electric vehicle solution:	\$383,292	\$314,226	\$334,692	\$222,426
Comparable diesel truck w/8% tax (refurb)³:	\$54,000	\$54,000	\$54,000	\$54,000
Cost difference:	\$329,292	\$260,226	\$280,692	\$168,426
Percent incentive required to achieve cost parity:	86%	83%	84%	76%

Note 1: The costs shown are for the base price of an Orange EV yard truck. Most fleets pay additional cost to install air conditioning, trailer stops, galvanizing, etc. These are optional costs, but in many places are necessary given the operating environment and/or stipulations in union contracts. For a remanufacture, the fleet must also supply an acceptable donor vehicle.

Note 2: Infrastructure is built out and paid for by the fleet (or site owner if the fleet is contracting services to the site); costs can vary dramatically by site. Costs are typically less for “standard onboard” charging due to lower voltage and amperage, and more readily available capacity. Factors that increase the cost of infrastructure include running cabling over long distances, installing a transformer, and hiring outside contractors (not as necessary for the standard onboard charging solution).

Note 3: Cost for diesel trucks can range from \$25,000 to \$120,000 based on refurbished vs. new, and the fleet's buying power. In most cases, fleets are not looking to buy a new Tier 4 diesel, but rather extend the life of a current truck or buy a refurbished vehicle that meets emission standards.

In Orange EV's experience, fleets are making capital last as long as they can and the alternative to a pure-electric solution is usually as stated in the table above. But for the scenario where fleets must purchase a new vehicle (i.e. life extension or purchasing refurbished aren't viable options), and assuming \$100,000 per diesel with 8% taxes, fleets would still require 72%, 66%, 68%, or 51% incentive funding (respectively, left to right on the table above) to achieve cost parity.

Offering maximum incentive levels increases the likelihood of replacing diesels with zero emission vehicles, accelerating widespread adoption, and achieving statewide emission reductions targets.



Utilize max percentages, OEM product approval, and a first-come first-approved model

We recommend utilizing percentages rather than fixed dollar amounts to set maximum funding levels. Infrastructure costs are site dependent and highly variable and new technology is more expensive by nature. By assigning a fixed maximum dollar amount, California risks discouraging innovation for the larger and more expensive zero emission vehicles and stifling projects that have increased infrastructure costs. Maximum percentages create a more robust environment for developing and implementing new technologies.

In our experience, the most effective incentive programs (such as California's HVIP, Chicago's Drive Clean Chicago, and New York's NYSEV-VIF) utilize OEM product approvals and a first-come, first-approved basis. This model simplifies the application, streamlines the process, and provides greater certainty for fleet managers, site managers, and manufacturers regarding the order/manufacture/delivery timeline.

While projects will be funded across categories, allocations should be technologically neutral and support viable technologies that meet the intended NOx reduction standards.

Benefits to Low-Income and Disadvantaged Communities

Focus and priority should be given for freight facilities located within the major trade corridors in California. These corridors align very well with disadvantaged communities. Funding projects in these locations (at least 25% across each category, as appropriate) will result in dramatically reduced emissions in disadvantaged communities, potentially much larger than current calculations estimate.

Studies show high diesel emissions at idle, low speed, and low load

Yard trucks typically operate in highly impacted areas in goods movement operations such as waste transfer stations, warehouses, distribution centers, manufacturing plants, rail intermodal yards, seaports, and more. Replacing diesel with 100% electric eliminates a calculated estimate of 1-2 tons of NOx per truck annually. Real world emissions may be significantly higher, though, according to a 2017 Wells to Wheels analysis ("Environmental implications of natural gas as a transportation fuel", Hao Cai et al).

In this analysis, multiple studies found that performance of a diesel's selective catalytic reduction (SCR) system is highly dependent on the duty cycle. In high-speed duty cycles, the SCR system performs well and diesel trucks have relatively low NOx emissions. In duty cycles with significant idling, low speeds, or low loads, however, diesel engine temperatures do not reach levels that support sustained SCR performance. This results in very high NOx emissions, up to 10x higher than the 2010 EPA NOx emission standard.

Given that yard trucks typically operate 10-15 mph, diesels may emit far more NOx than currently estimated, along with other criteria pollutants. Replacing diesels with 100% electric will eliminate truck emissions and improve air quality in disproportionately impacted communities.



Eligible Mitigation Action Categories to Consider

The VW Mitigation Trust Consent Decree outlines ten eligible categories for funding. The focus of our comments will relate to Category 1 (Class 8 Local Freight Trucks and Port Drayage Trucks) and Category 8 (Forklifts and Port Cargo Handling Equipment).

Allow functionally “similar-for-similar” replacement

Allowing “similar-for-similar” replacement in these (and perhaps other) categories has the potential to be transformative, focusing on the operational needs of a facility rather than strictly requiring “like-for-like” replacement. As an example, the role of a yard truck is often performed less efficiently by an over-the-road drayage truck. If the functionality of a diesel on-road drayage truck can be replaced with an all-electric yard truck, program goals are met, and the community and environment benefit.

Define “port” in broad terms

Yard trucks are specifically identified both Categories 1 and 8. Note, however, that in each Category, the word “port” is attached. In Category 1, drayage trucks are defined as “trucks hauling cargo to and from ports and intermodal rail yards” while Category 8 applies to port cargo handling equipment. Using the word “port” is potentially limiting since it evokes the image of a traditional seaport. In the broadest sense, ports are terminals which move cargo, and more and more, these terminals are clustered at inland transportation hubs in disadvantaged communities.

If mitigation fund projects under Categories 1 and 8 are limited to those located in traditional seaports, approximately 80% of yard truck operations will be eliminated; just 20% work in seaport operations. The Consent Decree does not define the word port, however, which gives states the flexibility to consider all yard truck projects that meet the overarching goal to reduce NOx emissions in impacted areas.

In discussions with other states, regulators have agreed that the Consent Decree provides leeway to define port to include all freight facilities. Utilizing this approach and including all goods movement equipment would align with existing California programs and enable adoption throughout freight corridors.

If a broad “port” definition is not adopted, then allocations of funds between categories should address the more restrictive number of opportunities in Categories 1 and 8, and prioritize funds to projects like these that result in greater environmental benefit.



Summary

To realize cost effective emissions reductions in California's VW Beneficiary Mitigation Plan, please ensure that all aspect of yard truck projects (vehicle, charging and infrastructure) are eligible for funding in all operating environments and at the maximum level allowed.

In today's market, pure-electric yard trucks can be "gateway" vehicles to heavy-duty electrics. Although yard trucks generally operate out of the public eye, word spreads quickly between yard operators and fleet companies. Successful deployments generate interest in a way that overcomes pre-conceived notions and speeds adoption of green technologies.

Orange EV has 100% electric Class 8 terminal trucks deployed and operating in fleets from California to New York. From these deployments, we have gathered a wealth of experience and data. Please consider us a resource and contact us if we can be of assistance.