Our State Should Use the EMT Funds to Reduce Port Emissions

Our state should use the VW EMT funds to electrify port facilities and achieve resulting reductions in NO_x, along with PM and CO_2. There are several technologies that we can and should invest in:

First, 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.

Second, funding should be used to speed turnover of the short-haul (drayage) fleet from diesel vehicles to zero emission electric alternatives. 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.[1]

Third, funding is available to invest in electric forklifts. Diesel forklifts are heavy emitters of local air pollution. Replacing these models with zero-emission electric alternatives eliminates tailpipe emissions. Today, electric forklifts are commercially available and have been widely adopted to replace their diesel counterparts. Each of these areas is assessed in further detail below.

A. Our State Should Build Out Shore-To-Ship Power ("Cold Ironing"):

Our state should use funds to build out the infrastructure necessary to allow ships to receive shore based electricity while they are at berth. Using electricity from on-shore facilities to power ships while they are at berth is referred to as "cold ironing."

Cold-ironing can significantly reduce at-berth emissions. However, the discrete impact of connecting to on-shore power depends on the class of vessel being connected. Passenger ships register longer hoteling (length of stay at berth) rates and require more electricity during those stays. Container ships use less energy while at berth and therefore have fewer emissions to reduce by connecting to shore-side power.[2] Maximizing NO_x reductions will require maximizing the number of ships capable of receiving shore-side power calling on ports capable of providing shore-side power. This can be most quickly accomplished by installing infrastructure at ports

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[1] 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).

[2] 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).

with a large percentage of returning vessels (i.e. "frequent callers"). Investment is therefore most appropriate at those terminals with high numbers of frequent callers.

Cold ironing can greatly reduce emissions of NO_x, $PM_{2.5}$, and CO_2. Replacing on-board auxiliary power with shore-side electricity reduces per call NO_x emissions by 62.1-89.9%; $PM_{2.5}$ emissions by 62.0-89.4%; and well-to-propeller CO_2 emissions by an estimated 22.4-37.6%.[3] Because the auxiliary burners used to self-generate hoteling power burn extremely dirty bunker fuel, these percentages equate to significant reductions in total pollution.

Emission Reductions from Cold-Ironing:[4]

	NO_x (lbs/call)	$PM_{2.5}$ (lbs/call)	CO_2 (lbs/call)	% of fleet Frequent Callers[5]
Container Ship	958.42	18.68	32,294	65%
Passenger Ship	1,635.29	26.62	46,007	97%

This technology is already being successfully implemented in California. The California Air Resources Board embraced this technology in its 2007 At-Berth Regulation.[6] These regulations mandated the use of shore power at California ports for: 50% of all calls by 2014; 70% of all calls by 2017; and 80% of all calls by 2020.[7] The experiences of California ports in building out the infrastructure needed to meet these regulations demonstrates the range of costs that ports might incur to provide cold-ironing. At the Port of Los Angeles (POLA), $70 million was needed to build out infrastructure to allow cold-ironing. At the Port of Long Beach (POLB), however, $200 million was spent to make similar improvements. The range of costs is largely attributable to existing infrastructure (i.e. power lines, substations) at POLA and their absence at POLB.

EMT funds can used for shore-side improvements, but are not available for vessel retrofits.[8] Funding is available to help offset the cost of "shore-side investments in cables, cable management systems, shore power coupler systems, distribution control systems, and power distribution."[9] Mitigation funds can be used to cover 100% of government owned shore-side

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[3] National Port Assessment, *supra* note 2 at 82.

[4] *See* National Port Assessment, *supra* note 2 at 84. For emission reductions on a port wide basis see same.

[5] "Frequent Caller" is defined differently for container and passenger ships. A container ship is a frequent caller if it makes at least six calls per year at a given port, whereas a passenger ship is a frequent caller if it makes at least five calls per year at a given port. National Port Strategy Assessment, *supra* note 2 at 83.

[6] *See* Cal. Code Regs. tit. 17, § 93118.3.

[7] *Id.* § 93118.3(d).

[8] 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 p. 5 (N.D. Cal. June 28, 2016).

[9] *Id.*

investment, but only 25% of non-government owned shore-side costs.[10] By focusing these funds on ports with the highest number of frequent callers the state can maximize the incentive for vessel owners to retrofit their ships to accept cold-ironing, a process that costs $500,000-$2,000,000.[11]

B. Our State Should Invest In Electric Drayage Trucks

EMT funds can also be used to convert drayage trucks--the short-haul transport vehicles used to move "cargo to and from ports and intermodal rail yards,"--to electric vehicles.[12] Many existing drayage trucks are retired long-haul vehicles that have been repurposed to serve shorter routes.[13] Due to this practice, the drayage fleet is made up of old, outdated, high emitting vehicles. Indeed, EPA estimates that in 2011 50% of the national drayage fleet was made of pre-1997 models, and that the same category will still comprise 24% of the fleet in 2020.[14] Drayage operators expect trucks to last an average of 10 years.[15] Replacing these old models with all electric trucks will therefore deliver lasting reductions in NO_x, PM and CO_2.[16]

Emission reductions from drayage trucks are largely dependent on the model year of the vehicle being replaced.[17] However, as a general matter, one can expect to achieve between 840 and 1,105 lbs per year of NO_x reductions by electrifying a single drayage vehicle.[18] PM and CO_2

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[10] *Id.*

[11] *See e.g.*, Parth Vaishnav, et al., *Shore Power for Vessels Calling at U.S. Ports: Benefits and Costs*, Environmental Science & Technology 50, no.3, 1104 (Feb. 2, 2016); *Cold Ironing Cost Effectiveness Study: Volume 1-Report*, Port of Long Beach, tbl. 6-7 Mar. 30, 2004 (providing range of demonstrated costs for retrofits) (*available at* http://www.polb.com/civica/filebank/blobdload.asp?BlobID=7718); *Draft Use of Shore-Side Power for Ocean Going Vessels*, American Association of Port Authorities, 23, May 1, 2007 (stating that retrofit costs range from $300,000 – $2 million per ship) (*available at* http://www.ops.wpci.nl/_images/_downloads/_original/1264151248_2007aapauseofshore-sidepowerforocean-goingvessels.pdf).

[12] Partial Consent Decree, *supra* note 8 at Appendix D-2 p. 11.

[13] National Port Strategy Assessment, *supra* note 2 at 14.

[14] *See* National Port Strategy Assessment, *supra* note 2 at tbl. 5-6.

[15] Andrew Papson & Michael Ippoliti, CALSTART, *Key Performance Parameters for Drayage Trucks Operating at the Ports of Los Angeles and Long Beach* 15 (Nov. 15, 2013) (providing results of Drayage Operator Usage Survey).

[16] EPA's emission standards for pre-2004 trucks allowed more than four grams of NO_x/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).

[17] Mitigation funds are available to target trucks with model years between 1992 and 2006. If state regulations already require replacing vehicles with these model years, then the eligible class expands to include model year 2007-2012 trucks. *See* Partial Consent Decree, *supra* note 8 at Appendix D-2 p. 1.

[18] National Port Strategy Assessment, *supra* note 2 at 43.

reductions are similarly significant: 21.7 lbs/year of PM and 12 tons of CO_2 reductions per year.[19]

Electric drayage trucks are currently more expensive than traditional diesel models. However, electric drayage trucks have far lower fuel and maintenance costs than diesel vehicles. Indeed, variable costs for all-electric drayage trucks are 50-85% lower than for their diesel counterparts.[20] The owner of a diesel truck must regularly: change oil, pass emissions tests, repair/replace brakes, and pay for diesel fuel. The owner of an electric truck can expect reduced or eliminated costs for each of these areas. TransPower estimates that the energy cost per mile of a diesel drayage truck is $1.49/mile while a TransPower electric drayage truck registers a per mile cost of only $.23.[21] Additionally, the cost of these zero emission vehicles is expected to dramatically decrease over the next fifteen years due to advances in battery production. As the capital requirements for drayage vehicles draw closer to equivalence, the economic benefits of electric trucks become even more pronounced.

Non-government owned drayage operators can receive mitigation funds to cover 40% of the cost of repowering with new diesel or alternative engines;[22] 50% of the cost of a new diesel or alternative fuel vehicle; 75% of the cost of repowering with an all-electric engine and associated infrastructure; and 75% of the cost of a new all-electric vehicle and associated infrastructure.[23]

These technologies have already been successfully demonstrated. In 2012, the Southern California Air Quality Management District engaged nine battery-electric trucks in a pilot project. SCAQMD has subsequently reinvested in 43 more electric drayage vehicles.[24] Electric drayage trucks are available from Mack[25] and TransPower[26].

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[19] National Port Strategy Assessment, *supra* note 2 at 43.

[20] Ambrose Hanjiro & Miguel Jaller, *Electrification of Drayage Trucks: On Track for a Sustainable Freight Path* at 14, Transportation Research Board 95th Annual Meeting, No. 16-5924 (Aug. 1, 2015).

[21] *High Power Electric Systems for Transportation and Storage*, Transpower, slide 10 (Dec. 2, 2015) *available at* http://steps.ucdavis.edu/files/12-03-2015-Joshua-GoldmanTransPower.pdf.

[22] Alternative engines and alternative fuels include hybrid designs. Partial Consent Decree, *supra* note 8 at Appendix D-2 p. 10.

[23] Partial Consent Decree, *supra* note 8 at Appendix D-2 p.1-2.

[24] Press Release, *State to Award $23.6 Million for Zero-Emission Trucks at Seaports*, SCAQMD, May 4, 2016, http://www.aqmd.gov/home/library/public-information/2016-news-archives/drayage-trucks

[25] Mack Trucks Inc., *Mack Trucks Demonstrating Zero-Emission Capable Drayage Trucks*, May 23, 2016, http://www.oemoffhighway.com/press_release/12210909/mack-trucks-demonstrating-zero-emission-capable-drayage-trucks.

[26] Transpower, *Electric Drayage Truck*, http://www.transpowerusa.com/downloads/Data-Sheet-Electric-Drayage-Truck-Utilizing-the-Electruck-Drive-System-1-3-14.pdf.

C. Our State Should Invest In Electric Forklifts

A wise use of mitigation funds is to replace diesel and propane forklifts with all-electric models. For private beneficiaries up to 75% of the cost of such improvements can be paid from settlement funds, while government beneficiaries may use funds to cover 100% of the cost. Only forklifts with greater than 8,000 lbs. of lift capacity are eligible to receive funding. [27]

Though electric forklifts require a greater up-front capital investment they already represent a large portion of the forklift fleet.[28] They also exhibit lower life-cycle costs when accounting for fuel and O&M than their diesel powered alternatives. The Energy Policy Research Institute estimates that an electric forklift with an 8,000 lb. lift capacity costs roughly $37,500 less than a similar propane model and $48,000 less than a similar diesel model over a projected six year lifespan. This is in spite of over $9,000 more in upfront capital cost.[29] The reasons for this significant economic advantage are a large decrease in fuel and maintenance costs associated with electrification. Additionally, electric models can save up to 137,000 lbs. of CO_2 over its lifetime and entirely eliminate the local emission of carbon monoxide and toxics.[30]

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[27] Partial Consent Decree, *supra* note 8 at Appendix D-2 p. 7-8.

[28] The current composition of the lift truck fleet is estimated at 60% electric, 40% combustion. Yale Materials Handling Corp., *The Truth About Electric Lift Trucks* (2010).

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

[30] *Id.*