I. Our State Should Invest The EMT Funds To Build Out Electric Light Duty Vehicle Charging Infrastructure

One primary place to invest EMT funds is in building out our state'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, multiunit dwellings or on highways.

Our state 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.

A. Our State Should Invest The EMT Funds To Jumpstart The Electrification Of Our Transportation Sector

Numerous studies have concluded that the absence of an adequate, existing charging infrastructure for LDV EVs is an impediment to rapidly increasing EV adoption.[1] This is true for several reasons. First, it creates a higher up front 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 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.

B. Our State Should Invest The EMT Funds To Build out LDV Charging Infrastructure At Multi-Unit Dwellings, Workplaces, Highways And Disadvantaged Communities

There are three overarching criteria that are useful for guiding where to build out charging infrastructure: is there an impediment to the market doing it on its own; are the locations places where the parked vehicles have long "dwell" times—i.e., they are parked for long periods of time; and will they increase public awareness? Collectively, these criteria present a strong argument for building LDV EV charging infrastructure in Multi-Unit Dwellings, Workplaces and Highways.

1) Highways

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.

[1] 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 . . . .").

More specifically, access to DC fast charging influences consumer's 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.[2] 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.[3] 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."[4] 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.[5]

2) 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."[6] Drivers are very unlikely to purchase an EV if they cannot charge at home.[7]

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

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

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

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

[6] 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).

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

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.[8] 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.[9]

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.

Our state should use the EMT funds to overcome the unique barriers to access infrastructure faced by residents of multi-unit dwellings by using the EMT funds to subsidize its development. Doing so will unlock the ability for people living in multi-unit dwelling in urban areas to charge their vehicle overnight while they sleep.

3) Workplaces

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.[10] 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.[11]

4) Disadvantaged Communities

In both siting charging infrastructure and in education and outreach, our state 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.

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

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

[10] 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

[11] 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).

They are a natural but largely untapped market for EVs.[12] 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.

B. Use of EMT Funds For LDV Charging Infrastructure Should Be Conditioned On Time Of Use Rates Or Some Other Load Management Tool, And Should Result in Opportunities For Fuel Cost Savings Compared to Fossil Fuels

It is very important that as our state uses the EMT funds to advance electrification of its transportation sector, the state simultaneously requires beneficiaries to utilize time of use rates or some other equally effective load management tool. Doing so is needed to ensure that EVs are charged at off peak times, or at times that can absorb excess renewable energy generation. This, in turn, will increase the operational efficiency of the existing grid by filling off-peak valleys, balancing intermitted generation, and allowing grid costs to be spread over a larger sales-base—resulting in potential benefits for all ratepayers.

As numerous studies make clear, EVs present utilities with a relatively flexible and manageable load because vehicles are only used for transportation purposes during a small fraction of the day.[13] Time-variant pricing can be a crucial tool for leveraging efficient charging, in particular by incentivizing EV owners to charge their cars at times when demand on the grid is low.[14] The Department of Energy's EV Project, which has tracked the charging behavior of thousands of EVs since 2011, has shown that in areas with time-of-use ("TOU") rates and effective utility education and outreach, the majority of EV charging can be shifted to off-peak hours.[15] In areas without TOU rates, EV demand often spiked in the early evening as drivers

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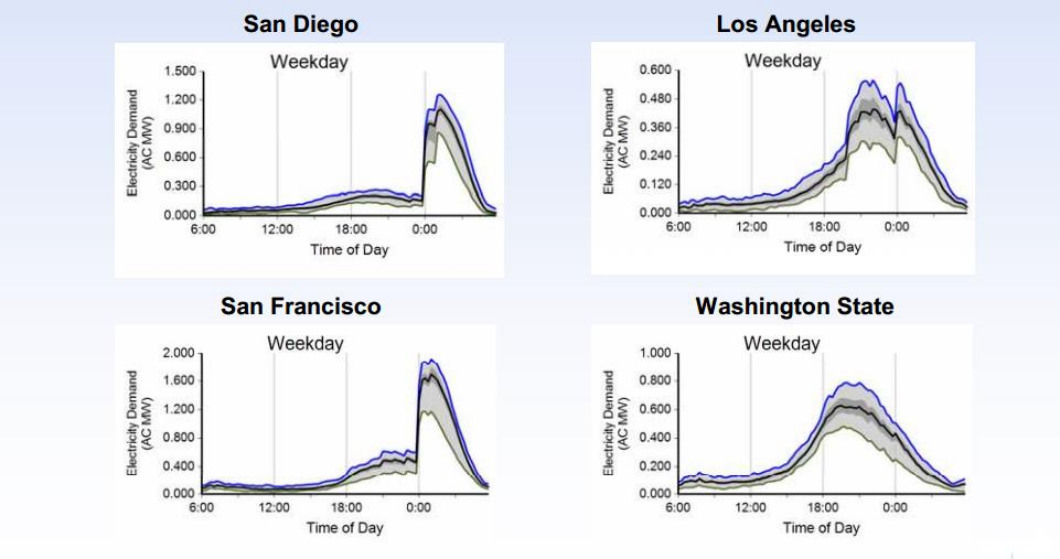
[12] C.C. Song, *Electric Vehicles; Who's Left Stranded?*, The Greenlining Institute at 4 (August, 2011).

[13] *See, e.g.*, Regulatory Assistance Project, *In the Drivers Seat: How Utilities and Consumers Can Benefit From the Shift to Electric Vehicles* at 4-7 (April 2015); CAISO, *California Vehicle-Grid Integration (VGI) Roadmap: Enabling Vehicle-Based Grid Services* (2014); CalTEA I at 19-20.

[14] *See, e.g.*, CalTEA II at 19-20; Regulatory Assistance Project, *In the Drivers Seat: How Utilities and Consumers Can Benefit From the Shift to Electric Vehicles* at 4-7 (April 2015); Glazner, *Electric Mobility and Smart Grids: Cost Effective Integration of Electric Vehicles with the Power Grid*, Symposium Energieinnovation (February 2012); Michael Kintner-Meyer, Kevin Schneider, & Robert Pratt, *Impacts Assessment of Plug-in Hybrid Vehicles on Electric Utilities and Regional U.S. Power Grids* (November, 2007).

[15] Schey, et al, *A First Look at the Impact of Electric Vehicle Charging on the Electric Grid*, The EV Project at EVS26 (May 2012).

returned home form work and plugged in their vehicles, exacerbating early-evening system-wide peak demand.[16] This is reflected in the charging patterns for several areas, shown below, with TOU pricing (San Diego and San Francisco) and without (Los Angeles and Washington State).



In addition, electricity is a fundamentally cheaper fuel than gasoline, and that advantage for PEV drivers should not be overridden, particularly using settlement funds intended for public benefit. Fuel cost savings are a key driver of EV purchases. One survey of over 16,000 EV drivers found that "saving money on fuel costs" was the most important motivator of their EV purchase.[17] The use of EMT funds should therefore be conditioned on charging rates being reasonable and delivering the fuel cost savings that electricity can provide.

[16] *Id.*

[17] Center for Sustainable Energy, *California Plug-in Electric Vehicle Owner Survey Dashboard*