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SMUD's Comments Re: California Plug-in Electric Vehicle Infrastructure Projections

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Additional submitted attachment is included below.

STATE OF CALIFORNIA
BEFORE THE CALIFORNIA ENERGY COMMISSION

In the matter of:	)	Docket No. 18-EVI-01
	)	
California Plug-In Electric Vehicle Infrastructure Projections: 2017 - 2025	))	SMUD Comments On Staff Workshop on May 23, 2018
	)	
	)	June 8, 2018

Comments of the Sacramento Municipal Utility District on Staff Workshop Concerning the California Plug-In Electric Vehicle Infrastructure Projections: 2017-2015

The Sacramento Municipal Utility District (SMUD) appreciates the opportunity to provide the following written comments on the staff report, *California Plug-In Electric Vehicle Infrastructure Projections: 2017-2025, Future Infrastructure Needs for Reaching the State's Zero-Emission Vehicle Deployment Goals.*

1) **Study time frame versus expected vehicle adoption and charging infrastructure deployment expectations**

SMUD recommends that the study should be expanded out to the year 2030 as a minimum and preferably out to 2035 given expected vehicle adoption curves. The expected PEV adoption curves to date predict a classic "S" shaped adoption curve with the year 2025 being near the bottom of the S curve and sharply accelerating market adoption rates expected during the latter half of the next decade. By stopping the study at 2025 it portrays a conclusion that 240,000 L2 Chargers and 10,000 DCFC will be adequate to meet market needs whereas vehicle adoption is expected to increase significantly after that time frame, requiring significantly more charging infrastructure to reach the 2030 goals. The increase in the adoption rate can be visualized by a simple comparison of the Governor's Executive Order B-16-2012 to have 1.5M PEV on the road by 2025 and then follow on Executive Order B-48-18 calling for 5M PEV's on the road by 2030. The amount of charging infrastructure identified in this report should not be viewed as a stopping point, but rather as a near term milestone, with significant additional infrastructure necessary going past 2025.

2) Trends in public charging going toward higher power DCFC plazas

SMUD feels this report could have benefitted by having a discussion on trends regarding public charging evolution toward DC Fast charging plazas. Current public charging stations appear to be trending toward high power DC Fast Charging plazas that feature upwards of 6 to 8 DC Fast Chargers per site. This approach has already been pioneered by Tesla in its nationwide charging network and seems to be gaining traction with EVGo and Electrify America. This trend will have significant impacts on electrical grid integration by requiring electrical service most likely in excess of 1MW. Each site will need to be carefully selected to not only be convenient for the drivers and nearby businesses, but also identify places where grid capacity is available to meet this load, or can be cost-effectively added. This careful selection process can increase costs of and lengthen schedules for charging infrastructure deployment.

SMUD agrees that this type of public charging infrastructure approach is necessary to overcome range anxiety market barriers. The discussion on this topic should also address technical barriers and potential solutions to support deployment of this type of charging infrastructure. Integrated energy storage, load management practices, and pricing structures can help to overcome high loading conditions and make this charging infrastructure more affordable for customers.

3) Effects of Charging Level versus Time of Day versus Smart Charging

The report identified the need for increasing the penetration of Level 2 charging versus Level 1 into the residential market to accommodate load shifting schemes to avoid grid impacts. SMUD found the opposite of this conclusion in a study we performed in 2014[1].

In our study, we simulated 140,000 PEV's attaching to the SMUD residential transformer fleet between 2012 and 2030. 140,000 vehicles in SMUD's service territory scales to approximately 3.5 million vehicles statewide by 2030. In that study, a higher charging level was found to have a greater impact on grid upgrade costs than the time--of-day when charging occurred. Staying at level 1 residential charging was almost as good at reducing grid impacts as simulated "smart" charging, modeled as having no coincident charging events taking place on any single residential transformer.

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[1] SAE Paper 2014-01-0344; J. Berkheimer, J. Tang, B. Boyce and D. Aswani, "Electric Grid Integration Costs for Plug-In Electric Vehicles," SAE Int. J. Alt. Power, vol. 3, no. 1, pp. 2014-01-0344, 2014.

While our study did conclude that smart charging with no two vehicles charged coincidentally produced the least amount of grid impact; the study did not include the costs that would be necessary for the communication and control network to affect that type of charging coordination. From that study and additional studies on grid impacts and grid value of managed charging,[2],[3],[4] SMUD estimates that the cost for smart charging would need to be no more than $15 to $20 per vehicle per year to be cost effective versus simple Level 1 residential charging.

Further study is required about the overall statewide loading and generation needs associated with on-peak Level 1 charging, as opposed to off-peak residential charging. This analysis would compare the overall cost to the system, including generation costs and distribution system costs to determine which alternative (L1 or L2 or smart charging) is more cost effective for on peak charging.

4) California Green Building Code EV Charging Readiness Requirement modeling

It would be interesting to project what the effects of the statewide green building code requirements for EV readiness would be on this analysis. At the state level the penetration of new building stock into the state could be modeled to determine what the effects of the green building code would have on these PEV charging infrastructure numbers. This could significantly reduce the cost and complexity of getting charging infrastructure installed in the state and also helps the transition from Level 1 charging to Level 2 charging.

5) Impacts from Free Charging

Although discussed in the workshop, the associated charging behavior of free charging should have been discussed in the study with regard to load shapes.

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[2] IEEE Paper 10.1109/PESGM.2015.7285968; D. Aswani and B. Boyce, "Autonomous Grid Services through Electric Vehicles," in IEEE Power & Energy Society General Meeting, Denver, CO, 2015.

[3] EPRI's 'Hotspotter' Tool: Identifying Potential Utility System Overloads in a Growing EV Market, EVS29 Symposium, Montreal, Quebec, J. Dunckley, D. Aswani, A. Maitra, J. Taylor, R. Radhakrishnan, D. MacCurdy, 2016

[4] Upcoming IEEE Paper (Conference paper id 6091, DOI not assigned yet); D. Aswani, B. Boyce, D. Yomogida. "Estimated Value of Smart / Managed Charging of Electric Vehicles for a Vertically Integrated Utility," in IEEE Transportation Electrification Conference, Long Beach, CA, 2018.

Because a significant portion of the vehicle population (Tesla Model S and X and Nissan Leaf No-Charge to Charge) has the ability to get free, public DC Fast Charging, the effect of free charging on the load shape should be shown in the report. For fee versus free DC Fast charging, behavior could have been shown and used with regard for the projections for DCFC. A specific study and usage profile for both would be helpful in looking at the kWh usage and load profile. SMUD believes the industry is more likely to trend toward fee-based applications in the future.

/s/

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cc: Corporate Files (LEG 2018-0311)