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**UC San Diego's Center for Energy Research Comments on 18-MISC-04
Vehicle Grid Integration Roadmap Update**

Additional submitted attachment is included below.



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RE: Comments on 18-MISC-04 Vehicle Grid Integration Roadmap Update

Workplace EVSE as a Cornerstone of Market Penetration

UC San Diego (UCSD) commends the California Energy Commission (CEC) on engaging in an update to the CA Vehicle Grid Integration (VGI) Roadmap that will broaden input from stakeholder interests that have emerged to the forefront in the past four years. Specifically, the role of workplace charging as an enabler of EV ownership in both underrepresented Disadvantaged Communities (DAC) and residents of Multi Unit Dwellings (MUD). The prevalent belief that single-family home charging will be the primary source of EV charging in the future needs to be challenged in the new Roadmap if the DAC and MUD populations are to be provided accessible and affordable EV Support Equipment (EVSE) infrastructure.

Employer investments in affordable and accessible EVSE, including large employers like UCSD, not only to serve, attract and retain quality employees, but also provide charging to underserved EV owners residing in DACs and MUDs. Furthermore, the same daytime EVSE infrastructure that serves the EV commuters synergistically support the overnight charging load of growing corporate fleets. A key to a sustainable business model for EVSE investment is asset utilization, which might best be accomplished with diurnal loads between EV commuters and corporate fleets. Moreover, the pending rate structure for Low Carbon Fuel Standard (LCFS) credits indicates the future economic and environmental value of vehicle grid integration will largely be derived from EVs plugged in during the mid-day on workdays rather than home charging during the evenings and weekends.

Representative examples of the leveraging role of workplace charging is found throughout the state. For example, UCSD's EVSE infrastructure has grown to be 122 Level 2 and three DC Fast Charging stations that currently serve on a monthly basis over 800 EV commuters and 54 fleet EVs. Five OEMs currently provide UCSD employees below market discounts for purchased and leased vehicles. In August 2018, UCSD dispensed 45 MWh to employees from all income levels, census tracts and housing types. Of greatest significance is that the growth rate of EV commuters and MWh dispensed is currently 9% per month at UCSD. Our Field of Dreams approach to EVSE investment of "Build it, and they will come" has been renamed, "Tiger by the Tail."



UCSD encourages the CEC to analyze sustainable workplace charging models as a cornerstone to enabling DAC, MUD, light duty fleet and public EV ownership in order to achieve CA's stated market goals.

Disadvantaged Communities as a Cornerstone of Market Penetration and Environmental Justice

Goals C1.1 & C1.2: Prioritize and track the benefits of managed PEV charging to low-income consumers and disadvantaged communities

As the CEC receives public comments and finalizes the VGI Roadmap, UC San Diego respectfully provides the following comment regarding DACs. UC San Diego suggests that the CEC adopt specific and separate goals as it pertains to VGI technology adoption and penetration in DACs including specific recognition of the barriers and challenges of smart charging utilization in multifamily unit dwellings.

UCSD's experience in forging new strategies and models for wider-scale EV penetration in DACs reflects our understanding and insight into the unique and differing factors and characteristics exhibited by DAC customers. These values must be recognized as materially different than those found in non-DAC communities. This uniqueness warrants separate consideration. Example of creative, innovated approaches utilized by UCSD include:

- Regional collaboration with faith-based institutions to identify prospective site locations for EVSE infrastructure;
- Inclusion of public school properties as hosts for both workforce-based and public charging stations;
- Demonstration EV projects with, and at, affordable MUDs that resulted from partnerships with affordable housing developers; and
- Hand-in-hand work with a "trusted Community-Based Organization" to drive EV information, education, culturally-sensitive outreach and customer experience for DAC residents/customers.

Based on its own innovative programs and efforts, UCSD urges that significant consideration be given to innovative, "out-of-the-box" thinking and approach in developing strategies for charging infrastructure and increased affordability and accessibility within DACs. The VGI Roadmap Update should prioritize, solicit, identify and establish separate goals addressing the barriers to advancing VGI technology to enable electric vehicle adoption by DAC customers.

Appropriate Planning Horizon

With accelerated targets for renewable generation deployment and a state commitment to a zero-carbon electricity sector by 2045, the updated VGI roadmap will benefit from analyzing and planning for VGI needs not only in the near-term, but perhaps more importantly in a future world that looks very different from today. One of the most challenging aspects of VGI implementation has always been the underlying value proposition: does the potential cost of VGI and its associated impacts to consumers justify the value that this technology can offer? In the near-term, with EV penetration comparatively low, consumer experience nascent, and the lack of compelling market incentives and structures, VGI goals and values are markedly different than



what may be present 15-20 years in the future. Subsequently, California's VGI Roadmap should ensure that its focus includes long-term planning scenarios.

New Customer Response Analysis as the Foundation of Future VGI Policy

A representative of Fleet Karma made a very cogent observation at the recent EPRI Conference on Electrification: that EV consumer behavior data more than three years old is stale and not representative of the consumer behavior of "Early Mainstream" customers. This premise is beginning to appear in UCSD's dataset of 2000+ unique drivers in the first nine months of 2018. Therefore, we would like to underscore two critical questions in connection to the Customer Experience to which the roadmap should consider paying closer attention.

First is the cost-effectiveness (or economic efficiency) of the various transportation electrification investments and state and local incentives that are currently on offer—through SB 350, for example—or that could be proposed and implemented in the near-to-medium term. That is, how much "bang for the buck" does the state get for each of these incentives across a range of implementation metrics, including environmental benefit. Moreover, is the full implementation of each of these equally plausible, or will it prove more challenging for a subset of them on behavioral or institutional grounds?

The CEC and the citizens of this state would benefit greatly from a longer-term view that pays attention to the consequences of partially implementing these incentives. We are in a position to make educated decisions that avoid expensive mistakes, but only if our analytical tools are brought to bear to evaluate the different policy instruments at our disposal.

Second is the consequential impact of consumer behavior. Analyses in this field have thus far restricted themselves to eliciting stated preferences or evaluating consumer "experience" or "satisfaction." This is deeply inadequate. Far more important is understanding how consumers respond to different incentives—and even to vehicle grid integration frameworks.

Consumer response will determine the extent to which vehicle grid integration achieves its desired objectives. Following the recommendations of techno-economic analyses that optimize for least-cost or other purely technical objectives could lead to misguided policy and poor implementation. Understanding the underlying roots of consumer behavior on questions of charging, cybersecurity, privacy, and vehicle-to-grid energy transfers will determine whether transportation electrification succeeds at all, and the extent to which features available to automakers and grid planners should be deployed. Analyses should compare not only the costs of various policy and market interventions but also the human behavioral response to them.

Economic Development and Utility Centric Planning of Transportation Electrification

The Roadmap must take full advantage of utility learnings over recent years and exploit a deep dive into the results of programs and offerings that have facilitated the present stages of market development. Clearly, there is a prevailing view that California's VGI stakeholder objectives are more than utility and grid centric. Importantly, there should be an expectation that load growth and modernization of the utility grid will focus on assuring that impacted regions hosting circuits where increases in capacity will require increased intelligence supporting load management enabled by VGI and other statewide grid modernization initiatives. There is an immediate need to



address complementary approaches to achieve synergistic outcomes incorporating increases in all forms of DER, and the dynamic nature of circuit load sensitivities.

With this utility circuit taxonomy in hand, several approaches need to be considered for mapping customers (sites and facilities) to the impacted circuits, and agree on the appropriate integration method (e.g., load management options). However, the greater challenge that the major EVSE players are discovering is finding sites hosts willing to install and maintain static EV charging under the current conditions. This certainly does interact with EV driver preferences, but understanding and responding to site host preferences and decision making is critical.

Consistent with all of the stated objectives of the VGI initiative, UCSD suggests that grid planning applications enabled the recently completed NREL EVI Pro tool could be of significant value in approaching a standardized methodology for planners to approach inclusion of Utility- and EVSP-owned/operated EVSE integration with a multidimensional view and with the ability to uniquely prioritize regional objectives in terms of VMT, congestion, emissions portfolio reductions targets, renewable energy integration, weather impacts, and emergency preparedness. UC San Diego suggests exploiting a plurality of existing statewide Geospatial Information Systems (GIS) portals for the purpose of expanding on DOE/NREL's EVI Pro platform to create a comprehensive methodology for assessing impacts on community and regional planning initiatives, providing a common and directly applicable methodology for VGI implantation.

A Weathered Eye on Technological Innovation

The incredible rate of innovation over the past two years in the electric transportation sectors has been staggering. Roadmap stakeholders should bear in mind that the rate of innovation is proportional to the rate of technological obsolescence. One of the larger challenges facing the updated Roadmap is the challenge facing all EVSE site hosts and public providers of maintaining customer loyalty and patronage in light of a rapidly changing commercial landscape. Today's challenges were best articulated more than five years ago.

An EV customer can choose when (time of day), where (location), how quickly (kW), how long (duration) and how often (frequency) to charge. For an EV customer, if EV fuel prices at one location and at one time are variable, it will influence EV charging not only at that location and time, but also charging at other locations and at other available times. To capture these interrelated location, variable costs, variable income opportunities and charging time dynamics, a market level approach (i.e., modeling all customer groups, vehicle types, charging locations, and prices) is required to evaluate load impacts and their corresponding costs and benefits for a price-based EV charging program. (JC Martin, SDG&E)

Conclusion

UC San Diego, and its various Organizational Research Units like the Center for Energy Research and Center for Global Justice, have partnered and participated in a myriad of CEC and State programs, as well as in private sector initiatives, to further the adoption and penetration of electric vehicles and electric vehicle charging infrastructure in workplace settings, multifamily properties and, especially in disadvantaged communities (DACs). Through its many and varied initiatives, UCSD has developed deep experiences and expertise in terms of understanding the challenges,



barriers, and overall issues affecting wide-scale EV adoption within the Roadmap's focus groups. We thank you for your consideration of these comments and look forward to continuing to support and partner with the CEC.