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DER Role and the need for an Smart Decision Support System

To the California Energy Commission:

Thank you for the opportunity to provide feedback on the U.S. DOTâ€™s Charging and Fueling Infrastructure (CFI) Grant Program. We applaud the Commissionâ€™s pursuit of these funds to accelerate zero-emission transportation, particularly in the crucial freight and drayage sectors.
In response to the Commission's call for input, we offer our expertise in transportation electrification research, specifically in areas of grid integration, load management, and renewable energy optimization.
Our team at San Diego State University, led by Professor Saeed Manshadi, has published extensively on these topics. We believe a key factor in maximizing the impact of CFI grants is aÂ strategic approach that incorporates distributed energy resources (DERs), such as solar PV and battery storage, along with intelligent load management strategies.
Here are our specific responses to the questions posed in the presentation:

1. Preference for Battery Electric or H2 MDHD Trucks:
While both technologies hold promise, determining the optimal choice for specific use cases requires a nuanced analysis considering factors such as duty cycles, refueling infrastructure availability, total cost of ownership, and environmental impacts.
Our research suggests that hybrid solutions, potentially integrating both battery-electric and hydrogen fueling, may offer the most flexibility and resilience in meeting diverse transportation needs.

2. Preferred Proportion of High-Powered vs. Low-Powered Truck Charging:
Determining the ideal mix of charging power levels is crucial for optimizing grid utilization, minimizing costs, and maximizing charging station availability.
We recommend a data-driven approach that considers factors such as truck duty cycles, dwell times at charging locations, electricity price signals, and grid capacity constraints.
Our research, utilizing reinforcement learning to optimize EV fleet charging, has demonstrated that intelligently scheduling charging, even at lower power levels, can significantly enhance renewable energy utilization and reduce grid impacts. [1]
Autonomous charging of electric vehicle fleets to enhance renewable generation dispatchabilityÂ

3. Estimated Cost Per kW/MW Per Site:
The cost per kW or MW can vary considerably depending on factors like location, site characteristics, charging technology, and grid connection requirements.
We advocate for transparent and standardized cost reporting to enable accurate cost-

benefit analyses and facilitate informed investment decisions.
Our research on the economics of EV charging station deployment offers insights into cost factors and strategies for minimizing investment risks. Â [2] Strategic Competition of Electric Vehicle Charging Stations in a Regulated Retail Electricity MarketÂ

4. Desire for Publicly Available Charging Reservation System:
A charging space reservation system could benefit both fleet operators and charging station owners by improving charging predictability and maximizing charger utilization. However, the implementation and effectiveness of such a system will depend on factors such as market adoption, pricing structures, data security, and user interface design.

5. Need for Pull-Through vs. Pull-In Spaces:
The choice of space design depends on the specific needs of the truck fleet and charging location.
A thorough assessment of truck types, turning radii, and space constraints is essential for making an optimal choice.

In addition to the above, we wish to offer the following recommendations:
Embrace a holistic approach:Â Consider charging infrastructure planning within a broader context, including interactions with distributed generation, load management technologies, and other DERs. This approach is vital to optimize grid impacts and maximize the return on CFI investments.

Prioritize intelligent load management:Â Leverage technologies like smart charging and VGI to schedule charging when renewable energy is abundant and minimize strain on the grid. Â [3] Unleashing Grid Services Potential of Electric Vehicles for the Volt/VAR Optimization ProblemÂ

Incorporate data-driven decision support tools:Â Utilize advanced modeling and analysis to optimize charger deployment, power levels, and load management strategies.

Develop partnerships with diverse stakeholders:Â Engage fleet operators, utilities, technology providers, and researchers to foster innovative solutions and maximize the impact of CFI funding.

Our research team is ready to collaborate with the CommissionÂ in developing and implementing a comprehensive and cost-effective TE infrastructure strategy.

We believe our expertise in modeling, optimization, and real-world analysis of EV charging systems, as demonstrated in our published work, can be valuable to the Commission in maximizing the benefits of the CFI grant program.

References are available to download at manshadi.sdsu.edu:

[1] Autonomous charging of electric vehicle fleets to enhance renewable generation

dispatchability
R Bayani, SD Manshadi, G Liu, Y Wang, R Dai,
CSEE Journal of Power and Energy Systems, 8 (3), 669-681, 2021.

[2] Strategic Competition of Electric Vehicle Charging Stations in a Regulated Retail Electricity Market
R Bayani, AF Soofi, SD Manshadi, 2022 IEEE Power & Energy Society General Meeting (PESGM), 1-5, 2022.

[3] Unleashing Grid Services Potential of Electric Vehicles for the Volt/VAR Optimization Problem
AF Soofi, SD Manshadi,
IEEE Transactions on Vehicular Technology, 2023.

Thank you for your consideration.

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