

Stakeholder Comments Template

Submitted by	Company	Date Submitted
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California ISO

Please use this template to provide your written comments on the ESDER Phase 3 stakeholder initiative workshop held on January 16, 2018.

Submit comments to InitiativeComments@CAISO.com

Comments are due January 26, 2018 by 5:00pm

In response to the CAISO’s request that stakeholders comment on the current list of priorities presented at the January 16, 2018 workshop, Nuvve Corporation (Nuvve) offers the following comments:

Nuvve appreciates the opportunity to comment on the current list of priorities presented at the CAISO’s January 16, 2018 ESDER Phase 3 stakeholder initiative workshop.

Nuvve is a San Diego based company operating in the U.S. and internationally whose mission is to lower the cost of electrical vehicle (EV) ownership while supporting the integration of renewable energy sources, such as wind and solar. Nuvve’s Grid Integrated Vehicle platform, GIVE™, transforms EVs into grid assets when those vehicles are charging, while guaranteeing the expected level of charge at the time the owner or driver needs it for transportation. The aggregation of thousands of parked and plugged in EVs into a virtual power plant using the GIVE platform allows Nuvve to provide EV drivers with significant benefits, while also participating in

electricity markets with a power capacity and capability comparable to traditional resources, using vehicle-to-grid (V2G) technology that is commercially available and viable today.

V2G technology enables the temporary use of EV batteries as a grid resource that is equivalent in function to stationary energy storage systems, but potentially at a lower cost due to the multiple value streams captured from the resource. V2G can provide ancillary services to the grid, such as frequency regulation and voltage control, while meeting the EV charging energy (transportation fuel) needs of drivers and reducing emissions. V2G can provide a full suite of grid services via the orchestrated charging and discharging of vehicle fleets, unlike V1G (managed charging) or other load management technologies which are limited by their unidirectional energy flow and cannot discharge energy to a customer's site or to the grid.

A significant reduction in fossil fuel emissions, like those captured in California's policy goals such as AB 32, Senate Bill (SB) 350, and Governor Brown's Zero Emission Vehicle objectives requires the safe and reliable integration of energy storage and renewable (and typically, intermittent) generation sources. Leveraging EVs as a storage resource is an obvious choice to achieve these goals. EVs, through V2G technology, have the potential to provide significant storage resources to enable that integration, while also lowering overall costs for utilities and their customers.

Nuvve's GIVE platform and V2G-capable EV and electric vehicle supply equipment (EVSE) are currently being demonstrated in California:

Electric Vehicle Storage Accelerator (EVSA) project: The EVSA project at the University of California, San Diego aims to demonstrate V2G technology as a low-cost energy storage resource while also providing test environments for Nissan and Honda to gain experience with V2G technologies. The project leverages the Nuvve GIVE platform to charge and discharge vehicles based on the needs of the grid and the project drivers. Nuvve manages the project on behalf of EVgo under funding from the California Public Utilities Commission (CPUC).

Intelligent Electric Vehicle Integration (INVENT) project: Nuvve was awarded a \$4.2 million CEC EPIC grant in 2017 "to demonstrate large scale electric vehicle fleet integration impacts on the grid, as well as to assess and provide quantification of potential benefits of plug-in electric vehicle's as grid assets amid a suitable population of vehicle users in concentrated and distributed areas"¹.

Nuvve's comments specific to the current list of priorities presented at the January 16, 2018 stakeholder workshop continue below the current list of priorities.

¹ http://www.energy.ca.gov/business_meetings/2017_packets/2017-06-14/Item_13_EPC-16-061.pdf

List of potential scope (DR, MUA, and NGR combined)

- ◆ **Demand response modeling limitations** – Resolving the issue of RUC that leads to infeasible 5-minute dispatches and minimum/maximum run time constraint recognition.
- ◆ **Variable demand response (weather sensitive)** – Exploring bidding options that reflect the variability of DR.
- ◆ **Removing the single LSE requirement/ DLA discussion** – Remove the requirement of a single LSE for DR with a subsequent discussion on if the DLA will need to be modified.
- ◆ **Load shift product** - Development of load shift capability with a consideration of additional technologies than just behind the meter storage.
- ◆ **Comprehensive review of MUA impacts** – Review of potential tariff changes in accordance with CPUC’s ruling/ working groups (including 24x7 participation requirement impact analysis).
- ◆ **Recognition of a behind the meter resource in load curtailment** – Extending the meter generator output (MGO) model to EVSEs.
- ◆ **Use-limitation status for NGRs** – Exploring the option to allow NGRs to qualify as a use-limited resource.
 - What constitutes use-limited status for NGR resources (i.e. batteries)?
- ◆ **Bidding Costs** – What bidding costs need to be captured for NGRs? (i.e. cost based offers)
- ◆ **Establishing throughput limitations** – Creating bidding options to manage excessive cycling of NGRs.
- ◆ **Management of State of Charge (SOC)** – Considering options for the management of SOC such as a multi-stacked ancillary service bid.
- ◆ **Recognition of a behind the meter resource in load curtailment** – Extending the meter generator output (MGO) model to sub-meter and develop individual baselines to all other individual load types.
- ◆ **PDR/RDRR hybrid resource** – Exploring how a DR resource that can be economic (PDR) for a limited amount and can transfer to become an RDRR.
- ◆ **Continued discussion on use-cases for MUA** – Determining participation models for new technologies such as micro-grids through use-case scenarios.

Nuvve’s Comments:

Because V2G relies on a distributed fleet of EVs functioning as grid resources, the success of V2G deployment and its viability as a future business model depend on the flexibility provided by the regulatory and market frameworks in which it operates. As such, the ESDER Issue Paper and stakeholder processes have identified several issues relevant and impactful to Nuvve’s business and V2G more broadly. In general, Nuvve agrees with the current list of priority items

presented at the January 16, 2018 workshop, but strongly encourages escalating the prioritization of item 3.1.6 from the ESDER 3 Issue Paper:

Recognition of a behind the meter resource in load curtailment – Extending the meter generator output (MGO) model to EVSEs.

As noted by other stakeholders' comments on the November 6, 2017 workshop², recognition of behind the meter EV resources in load curtailment (and/or load increases that can address renewable overgeneration or other negative pricing conditions, or energy discharges to the grid via V2G) is a necessary step in California's efforts to significantly increase the adoption of EVs in the state. By utilizing the embedded submetering capability of EVSE, operators leveraging the capabilities of a distributed fleet of mobile storage resources will be able to bring related services to the market with viable business models that generate benefits for customers, the grid, and society overall. Absent an approved submetering approach, the business models for V2G and other EV-related demand management services will be encumbered by costs likely to make projects uneconomical – eliminating the possibility of V2G market revenues offsetting costs for EV, EVSE and related infrastructure that would encourage widespread adoption of transportation electrification that are central to California's GHG emission reduction goals.

Because this issue is central to the viability of V2G business models in California, and these technologies are commercially available now, Nuvve strongly encourages the CAISO to escalate the priority of this item in the ESDER process so that it is addressed in 2018. Nuvve believes that this prioritization will enable the CAISO and stakeholder community to address a key issue that, when resolved, will result in the accelerated deployment of EVs and related infrastructure in California, which in turn will result in the reduction of transportation-related emissions and lower overall costs for electric customers.

Other comments

Please provide any additional comments not associated with the topics above.

Comments:

Nuvve has no additional comments at this time.

² Stakeholder Comments on the November 6, 2017 workshop of the Joint EV Parties, <https://www.caiso.com/Documents/JointEVChargingPartiesComments-EnergyStorage-DistributedEnergyResourcesPhase3Workshop-Nov62017.pdf> and eMotorWerks <https://www.caiso.com/Documents/eMotorWerksComments-EnergyStorage-DistributedEnergyResourcesPhase3Workshop-Nov62017.pdf>