COMMENTS OF SOLARCITY

Energy Storage and Distributed Energy Resources Issue Paper Straw Proposal

Submitted by	Company	Date Submitted
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SolarCity offers these comments on the Energy Storage and Distributed Energy Resources (ESDER) Paper Straw Proposal, and looks forward to further discussion on these important topics in the ESDER stakeholder initiative.

Non-generator resource (NGR) model enhancements

Under this topic, the ISO has stated it will consider limited enhancements to the NGR model in 2015. SolarCity therefore developed these comments with an eye towards developing specific recommendations based on the ISO's initial straw proposal addressing the following four areas.

A. Enhance NGR documentation

In order to effectively streamline access to information for participants interested in the NGR model and all enhancements, all updated documentation regarding the NGR model – as well as previous documentation, stakeholder processes, and any other pertinent information– should be linked to one centralized page devoted to NGRs on the CAISO website (to increase market knowledge and understanding of NGRs for all stakeholders). In order to effectively communicate with interested stakeholders, we believe that a dedicated page to house material will simplify the process. As highlighted in subsequent comments, SolarCity would appreciate additional clarification on the status and path to aggregate small assets into an NGR and provide the most stringent ancillary services, including regulation energy management / frequency regulation up and down.

B. Clarify how the ISO uses state of charge in market optimization.

SolarCity strongly supports the ISO proposal to clarify state of charge (SOC) in market optimization and include this information in externally available NGR documentation for stakeholders and market participants.

C. Evaluate initial state of charge as a submitted parameter in the day-ahead market.

SolarCity believes this is a needed step forward in the modeling of NGRs. Having a SOC value of 50% of the maximum energy limit as the default when there were no previous day's awards was a challenging feature and this change is an improvement. We applaud the CAISO for making this adjustment.

The CAISO should, however, plan for multiple use applications of NGRs in their modeling, and ensure that market participants have the flexibility to offer their resources to the CAISO in ways that constrain operations behind a customer's meter or on distribution system during times when the resource is not provided to the CAISO. For example, an additional modeling refinement could be allowing a Scheduling Coordinator (SC) to specify a minimum SOC parameter that the NGR must have at the end of its awarded day-ahead schedule. The CAISO should consider such scenarios to facilitate and not impede multiple use-case applications in the future, which is critical to maximizing the value of energy storage.

D. Evaluate option to not provide energy limits or have ISO co-optimize an NGR based on state of charge.

SolarCity supports the step to evaluate an option for NGRs to be modeled similarly to a traditional generator, which does not experience the energy constraints of a typical NGR. This is also a good step forward in modeling NGRs, particularly as we move into DER aggregations and multiple use applications.

Proxy Demand Resource (PDR) and Reliability Demand Response Resource (RDRR) enhancements

Generally, SolarCity believes enhancements to the baseline programs that reflect changing technology and deployment models are a positive step forward towards enhancing participation in PDR and RDRR. However, SolarCity is cautious of the third principle concerning development of alternative baselines methodologies: "Ease of Implementation – ISO systems and process much be able to implement the alternate baseline."

While implementation is always a practical concern, CAISO should be cautious of prematurely defining implementation standards that are only incremental and could lead to sub-optimal market design for rapidly evolving technologies and deployment models. To the extent more fundamental changes to baseline methodologies will be needed in the intermediate term, in order to properly accommodate behind-the-meter resources and continuous advancements in metering, monitoring and communications technology, implementation barriers should not

drive policy decisions. Policy decisions should drive implementation. For example, if for the time being, ISO's systems cannot implement a meter generator output baseline; this should be clearly defined as a technical obstacle and not a policy determination.

Non-resource adequacy multiple use applications

Please provide your comments on each of the two non-RA scenarios the ISO has proposed to address. Also, the ISO strongly encourages stakeholders to identify and describe use cases under each scenario (including diagrams of the configurations contemplated for these use cases), and specific issues not covered in these scenarios that should be addressed in this initiative.

SolarCity is primarily focused on on deploying assets located behind the customer's meter that are technically capable of providing services to a customer, distribution system operators (DSO) and the ISO. In most cases, our customer's assets are individually small by conventional power industry standards, but can be collectively large when aggregated and operated in coordination.

Type 1: Resource provides services to the distribution system and participates in the ISO market.

SolarCity interprets the questions regarding Type 1 and Type 2 multiple-use resources as primarily focused on the common issue of multiple "masters" instructing a single resource or aggregation of resources. In both cases, ISO seeks clarification on how to address a resource participating in its market in real-time that has a separate and distinct entity also providing operating instructions.

While there are important billing, interconnection and regulatory issues associated with a resource being located on the distribution grid versus behind a customer's meter, the "master" issue should be functionally the same in Type 1 and Type 2 resources from an ISO perspective. For example, whether a 1MW/2MWh battery is providing peak demand management to a commercial end-user or substation capacity to a distribution operator, the potential for multiple-use conflict is the same. Both scenarios result in a multiple "master" issue, and thus a proposed solution to this problem should be the same for Type 1 and Type 2 resources.

To the extent the ISO perceives Type 1 and Type 2 resources as fundamentally different, the ISO should provide clarification in subsequent presentations and proposals.

CAISO Question 1 – *How do we manage conflicting real-time needs or dispatches by the distribution utility and the ISO?*

The Straw Proposal presents a future scenario in which a DER or aggregation of DERs is both participating in wholesale markets and "subject to some form of dispatch or direct control by the distribution utility" as terms of a DSO contract to provide services like "voltage support and power quality" and "deferment of distribution system infrastructure upgrades."

Financial incentives are sufficient signals to prevent inefficient operation of resources.

At a high level, SolarCity believes price signals are sufficient incentives to address scenarios where resources receive conflicting real-time instructions. As the ISO mentions in the Straw Proposal, failing to fully follow the ISO dispatch would result in uninstructed deviation penalties in the ISO market and would be settled accordingly. Similarly, failing to fully follow distribution

operator dispatch would result in penalties or opportunity costs based on the terms of those contracts that would drive behavior. In both cases, the risk and reward of DER operations falls squarely on the DER owner and aggregator, and thus the DER owner would be able to provide direction on which instruction to follow, and take the financial penalty for failing to follow both instructions.

SolarCity also notes that financial incentives would lead resource owners to avoid bidding or signing contracts that could regularly result in conflicting dispatch instructions, since it is unlikely to be economically rational behavior.

In the event of an emergency condition on the grid, safety- and contingency-driven dispatch by the distribution operator would take precedence, similar to distribution-connected wholesale resources today.

While explicit dual-use participation is new, SolarCity notes any resource accessing the ISO through the distribution grid today presents the possibility of conflicting real-time dispatch during infrequent, emergency conditions. For example, a distribution operator could require a distribution-connected wholesale generator to shut down in order to de-energize a feeder or line for safety or maintenance-related work. In that scenario, the distribution-connected generator would follow the distribution operator's instruction and be subject to uninstructed deviation charges (financial penalties) for failing to deliver if simultaneously awarded in the ISO market. Similarly, a DER would be required to respond to the distribution operator in the event of a conflicting dispatch instruction during infrequent, local contingencies.

CAISO Question 2 – *If distribution system and ISO needs are aligned, and the resource's actions meet the needs of both, is there a concern about the resource being paid twice for the same performance? Under what situations is double payment a concern? How should we address this concern?*

To drive clarity in stakeholder discussion, the ISO should carefully consider the definition of "double payment." To the extent a resource's counterparties (whether a host customer, distribution system operator or ISO) seek attributes that are similar but not identical, resources are not being "compensated twice for the same performance." For example, a resource providing substation capacity to a specific area of the distribution system is providing a location-specific service that is both (a) more granular than the CAISO's pricing resolution is capable of and (b) distinct from CAISO product attributes. While this resource may simultaneously provide energy that reduces peak demand on a substation and supply energy to the ISO at the closest LMP, the resource is providing a distinct set of attributes and performance to each counter party. Similarly, customers providing demand response are avoiding energy consumption (and cost) through reduced load, but are compensated for doing so because it deviates from normal behavior.

Furthermore, to the extent a resource earns revenue based on multiple prices, and those prices are established independently of each other, there is no "double payment". For example, a generator operating under a long term power purchase agreement and self-scheduling or economically bidding into CAISO's energy market could be considered to be "compensated

twice for the same performance;" however, the revenue streams are independently priced and the end use attributes not identical.

Practically speaking, the existence of "double payments" is not sustainable in competitive markets for distribution services and wholesale markets because competition will drive suppliers towards marginal cost pricing. For example, resource adequacy contracts could be considered at risk of offering "double payments;" however, a resource that failed to consider any energy market revenues in pricing its resource adequacy contract would ultimately be less competitive than peers. Similarly, a resource that ignored the ISO energy value of its substation capacity would offer distribution capacity contract prices that are not competitive.

Stakeholder discussion would benefit from specific examples of concern being presented by the ISO, as well as a formal definition of "double payments."

CAISO Question 3 – *Should any restrictions be on a DER aggregation or the sub-resources of a DER aggregation providing distribution-level services? Would the distribution utility ever call upon a multi-pricing node DER aggregation to address a local distribution problem?*

Based on the Straw Proposal, the ISO identified this issue as potentially "highly problematic." In future workshops and papers, the ISO should elaborate on what precisely is problematic for the benefit of all stakeholders. A more detailed explanation of the problems the ISO anticipates occurring would enable stakeholders to offer more concrete solutions and thoughts.

To be clear, a distribution utility would be unlikely to call upon a DER aggregation covering multiple pricing nodes on the ISO system to address a local distribution problem. DER portfolios less granular than distribution substations are of limited use to distribution operators, and are most likely to be dispatched at the multi-feeder, feeder or even sub-feeder (line section) level.

It is feasible that a distribution utility would seek a subset of an ISO DER aggregation to address a local distribution problem, if that subset had been offered and contracted to the distribution utility by the DER Aggregator. Under that scenario, the subset of DERs in the broader ISO DER aggregation could receive conflicting instructions; however, SolarCity would anticipate managing that performance risk as the DER Aggregator. If a subset of DERs in the broader ISO DER Aggregation were not available due to distribution utility instruction, the DER aggregator would make up for the gap with other resources in the ISO DER Aggregation. If there were insufficient resources to fill the gap, the DER aggregator would be exposed to the financial disincentives associated with non-performance, as previously discussed.

In terms of "distribution-level services alter[ing] the performance characteristics of the ISO resource", the ISO's concerns suggest it would be operationally problematic for the geographic distribution of a DER aggregation's performance to vary based on time, day of the week, weather, etc. If the ISO requires a static view of the DER Aggregation's expected performance, the operational concern likely extends beyond the topic of distribution operators dispatching sub-resources for local distribution needs. To be clear, DER aggregations could ultimately comprise tens, hundreds or thousands of small resources, including a diverse range of enabling technologies and behaviors, such as smart thermostats, battery storage, controllable thermal loads, advanced inverter functionality and customer's behavioral change. Similar to how conventional generators can be rated based on ambient weather conditions, the performance

of a single multi p-node DER Aggregation could vary geographically based on a variety of factors, including time of day, day of week and weather, among others.

One potential solution is that the ISO DER aggregator could coordinate with the ISO when bidding into its markets, potentially providing information that would help the ISO "weight" the portfolio's distribution if called upon during that time interval. Additional examples from the ISO would be helpful to inform further discussion, which is warranted. Additionally, closer coordination and in-depth discussions with utility distribution system operators should be a goal of this stakeholder initiative.

Type 2: Resource provides services to end-use customers and participates in the ISO market.

(b) DER installed behind customer meter, such that flow across the customer meter can be net load or net injection at different time;

Given SolarCity's deployment of controllable DERs alongside rooftop solar, the treatment of this use case is of paramount importance to SolarCity's. For reference, the ISO states that "DERs installed behind the customer meter, such that flow across the customer meter can be net load or net injection at different times, is a scenario consistent with ISO's non-generator resource (NGR) model."

SolarCity does not dispute this position, but notes that the NGR minimum rated capacity is 500 kw, consistent with the ISO's minimum capacity for generation resources. It is SolarCity's understanding that DER Aggregations should ultimately be eligible as NGRs, but it is not clear from the proposal what the status of that discussion is and an implementation schedule. Per the ISO's intention to "enhance NGR documentation", providing a clear status on the ability of the use-case below to aggregate and participate in the ISO market as an NGR aggregation would be beneficial to all stakeholders considering this type of participation.

Example– Residential Storage Aggregation

Smart Energy Homes: Within a California pricing node (p-node), SolarCity installs a smart energy system on 100 residential homes, including:

- 6 kW dc rooftop solar system
- 5 kW / 10 kWh lithium-ion battery
- 5 kw advanced DC-AC inverter

Capabilities: In aggregate, the residential homes have 500 kw of flexible storage that can be operated in a coordinated way as a single ISO DER resource. The portfolio resource meets CAISO's minimum size criteria for non-generating resources and can be dispatched in accordance with CAISO market requirements.

Goal: Access to economically bid the 500 kw aggregated battery as a non-generator resource into CAISO's energy and ancillary services markets during periods when the battery is not needed for the customer's use-case.