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Energy Storage and Distributed Energy Resources Phase 4

Issue Paper

February 6, 2019

Market & Infrastructure Policy

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1 Introduction

The focus of the California Independent System Operator's (CAISO) energy storage and distributed energy resources (ESDER) initiative is to lower barriers and enhance the abilities of these specific resources to participate in the CAISO markets.[1] The number and diversity of these resources continue to grow, and represents an important part of the future grid.

The ESDER initiative is an omnibus initiative covering several related but distinct topics. In ESDER 3, the CAISO developed several enhancements to the Proxy Demand Resource (PDR) participation model as well as a new load shift product. The CAISO Board of Governors approved ESDER 3 in September 2018 with a projected implementation date of fall of 2019.[2]

The purpose of this issue paper is to introduce the fourth phase of the ESDER initiative. ESDER 4 will continue to make enhancements to the interaction and participation models of both storage and distributed energy resources in the CAISO markets.

ESDER 4 will address the following topics:

1. Enhancements to the Non-Generator Resource (NGR) model – Reviewing the CAISO's market optimization of NGRs and participation agreements;
2. Bidding requirements – Considering bidding requirements to optimally use energy storage resources;
3. Demand Response Enhancements – Reflecting the operational characteristics of PDR; and
4. Multiple-Use Application provisions (MUA) —Consideration of MUA rules and application to CAISO market participation.

2 Stakeholder Process

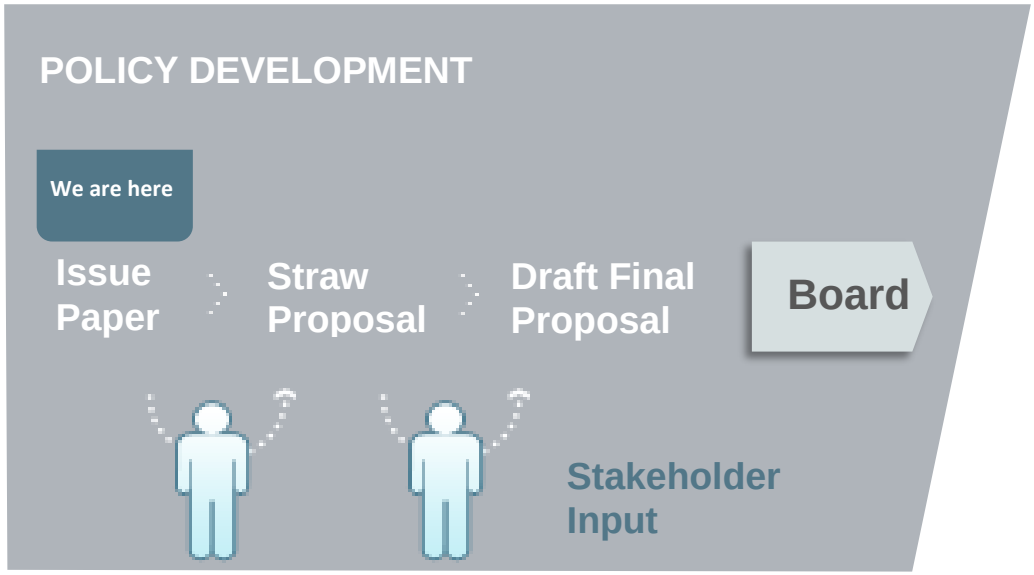
The CAISO is at the "Issue Paper" stage in the ESDER 4 stakeholder process. Figure 1 below shows the status of the issue paper within the overall ESDER 4 stakeholder process.

[1] DERs are those resources on the distribution system on either the utility side or the customer side of the end-use customer meter, including rooftop solar, energy storage, plug-in electric vehicles, and demand response.

[2] http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorage_DistributedEnergyResources.aspx

The purpose of the issue paper is to identify and prioritize issues related to the integration, modeling, and participation of energy storage and DERs in the CAISO market. After publication of the issue paper and an initial stakeholder call, the CAISO will hold workshops as necessary to engage stakeholders in the policy design process on the prioritized topics. As appropriate, the CAISO may organize focused working groups to address issues of a complex nature or those that have cross-jurisdictional concerns as we move through the initiative process. The CAISO's intent is to follow up the issue paper with a straw proposal that will restate and clarify the prioritized issues based on stakeholder feedback and input, and propose solutions to these issues.

Figure 1: Stakeholder Process for ESDER 3 Stakeholder Initiative



3 Non-Generator Resource Model

The CAISO introduced the NGR model in 2012 to allow for wholesale market participation of energy storage resources. Although the CAISO believes the NGR model effectively integrates energy storage resources today, the increasing number of storage devices participating in the wholesale market warrants further investigation of whether possible enhancements to the model are necessary to ensure that the CAISO is optimally using these unique resources to meet the reliability needs of the grid.

3.1 Real-time state of charge management

The real-time market optimization horizon may impede scheduling coordinators from optimally managing their NGR over the day. The real-time market optimizes schedules over a 1 hour and 45 minute time horizon that does not consider conditions later in the day. Additionally, the market does not ensure that the resource state of charge (SOC) at the end of the time horizon is sufficient to meet future dispatches beyond the real-time market horizon. For instance, based on the resource's bids, the real-time market may find that it is optimal, over the short-term, to leave an NGR fully discharged early in the day. However, leaving the resource in this state could prevent the optimal use of the resource over the entire day given the limited real-time outlook.

A scheduling coordinator may want to manage an NGR's SOC throughout the day so that it has enough energy to meet its day-ahead schedules later in the day. For example, if a scheduling coordinator could specify the SOC level of their resource at the end of an operating hour, the scheduling coordinator could ensure that the real-time market does not dispatch the resource below the SOC needed to meet the resource's day-ahead schedule.

The CAISO will explore in ESDER 4 if additional SOC parameters can improve a scheduling coordinator's ability to manage the optimal use of non-generator resources throughout the day.

3.2 Effects of Multi-Interval Optimization

An NGR may receive an uneconomic outcome if the price in a future interval does not materialize as anticipated. Due to the CAISO's multi-interval optimization, a resource is economic over the market horizon considering its single binding interval dispatch and each of its advisory interval dispatches. There are instances when a resource receives an award to charge, which may be higher than its bid for the financially binding interval, but the optimization identifies a future interval with greater economic incentive for the resource to discharge. However, if future prices do not materialize, this may result in a revenue shortfall for the binding interval, which is addressed through real-time bid cost recovery. The CAISO believes this is an appropriate and reasonable outcome given a multi-interval optimization with bid cost recovery provisions; however, the CAISO is open to discussing this issue further with stakeholders in ESDER 4.

3.3 NGR Participation Agreements

The CAISO currently utilizes both the Participating Generator Agreement (PGA) and Participating Load Agreement (PLA) to facilitate the implementation of NGRs in the CAISO markets. In order to reduce administrative burden and improve efficiency, the CAISO proposes to consider allowing NGRs to participate in the CAISO market solely under the PGA. Moreover, the CAISO will also propose to allow NGRs acting as dispatchable demand response (DDR) to participate in the CAISO market solely under the PLA. These modifications will not affect the current treatment of NGR and DDR resources in any CAISO market systems for implementation. NGRs that have already executed PGAs and PLAs will not be required to execute new agreements.

4 Bidding Requirements for Energy Storage Resources

To ensure that wholesale prices are just and reasonable under the Federal Power Act, the CAISO and other organized wholesale markets have mitigation measures to minimize the exercise of market power and non-competitive outcomes. For example, a generator may have the ability to exercise market power when supplying energy within a transmission-constrained area if it is a pivotal supplier. The CAISO employs local market power mitigation measures to help ensure that market prices are economic in uncompetitive situations by replacing specific bids for resources with bids reflecting that resource's marginal cost.

Currently, the CAISO does not mitigate NGRs for local market power. However, with increasing numbers of energy storage resources participating in the market, the CAISO must consider potential market impacts and mitigation tools applicable to storage resources.

5 Demand Response Resources

5.1 Operational Characteristics

DR resources with a Pmin of 0 MW face challenges reflecting their operational limitations in the CAISO market. Today, all resources committed in the residual unit commitment (RUC) process move to its minimum output value (Pmin). In the case of a DR resource, it is sent to a Pmin of 0 MW. The market then holds the

DR resource at its Pmin (respecting its minimum run time) and assumes the resource is ready to curtail load when dispatched.[3]

The scenario above results in the DR resource potentially receiving a dispatch to curtail in one interval, with an instruction to return to its Pmin of 0 MW in the second interval, and a subsequent dispatch to curtail in another interval. While the market systems act rationally, seeing the DR resource as economic and capable of moving between its Pmin and Pmax in any interval the resource is online, certain DR resources are inflexible and only able to provide a single sustained response from its Pmin.

In ESDER 3, the CAISO designed the hourly and 15-minute bidding options for PDRs to extend notification times and longer duration interval dispatches. Additionally, with the implementation of the Commitment Cost and Default Energy Bid Enhancements (CCDEBE)[4] and Commitment Cost Enhancements (CCE3)[5] initiatives, resources will reflect start up and minimum load costs. In ESDER 4, the CAISO will vet with DR stakeholders the various options available to reflect their resource's operational characteristics.

5.2 Weather-Sensitive DR

The maximum output of certain DR resources can vary due to their weather-sensitive nature. When a weather-sensitive DR resource bids its RA-qualifying capacity into the day-ahead market, depending on the weather, it may be unable to deliver its full RA amount in real-time. If the resource cannot legitimately bid its full capacity and deliver it under its must offer obligation, the resource will be assessed penalties through the Resource Adequacy Availability Incentive Mechanism (RAAIM). This issue will need vetting at the CPUC and with other LRAs since the matter is fundamentally about how resource adequacy qualifying

[3] Definition of minimum run time
http://www.caiso.com/Documents/Section34_RealTimeMarket_asof_May2_2017.pdf

[4] Commitment costs and default energy bid enhancements (CCDEBE) policy page
http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCosts_DefaultEnergyBidEnhancements.aspx

[5] Commitment cost enhancements (CCE3) reference material
http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCostEnhancements.aspx

capacity is determined and set for weather-sensitive DR resource types. To help jump start this issue, the CAISO will discuss options about how to operationalize and accommodate weather-sensitive DR in advance of, when the CPUC establishes and executes an accurate RA counting methodology for weather-sensitive DR.

6 Multiple-Use Applications

Based on a joint proposal from the CAISO and CPUC staff, the California Public Utilities Commission (CPUC) adopted a decision on MUAs that included eleven rules to guide the formation of MUAs, including those using energy storage.[6] The CAISO will examine the application of these MUA rules in the CAISO market in ESDER 4. For instance, stakeholders have questioned whether NGRs should be able to choose which market intervals to participate. Currently, NGRs are 24x7 wholesale market resources (comparable to all other resources that supply energy). Meaning, NGRs are financially settled for charge or discharge in a given interval, irrespective of whether the resource received a CAISO dispatch instruction. The CAISO understands stakeholders' desires to provide services to other entities from the same device, while providing reliability services to the CAISO. The CAISO will explore with stakeholders whether and how such treatment could be possible in ESDER 4 and in the context of the CPUC's MUA rules.

7 Next Steps

In this issue paper, the CAISO has tried to balance CAISO's priority to effectively manage the transforming grid, stakeholder requests, and preparing for the increased participation of energy storage and DERs. The CAISO will hold a stakeholder call on February 13, 2019 to review the issue paper. The CAISO also plans to hold working group meetings to further refine these items and prioritize issues before the straw proposal. The CAISO encourages all stakeholders to submit comments on the issue paper and any additional items that might be considered as part of ESDER 4. Lastly, the CAISO requests stakeholders present data, if available, to help inform any of the identified issues detailed above or any new issues submitted through comments.

[6] http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M206/K462/206462341.pdf