

September 3, 2019

The Honorable Kimberly D. Bose  
Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, DC 20426

**Re: California Independent System Operator Corporation  
Docket No. ER19- \_\_\_\_ -000**

**Tariff Amendment to Implement Demand Response  
Enhancements**

**Request for Waiver of Notice Period**

Dear Secretary Bose:

The California Independent System Operator Corporation (“CAISO”) submits this tariff amendment to enhance demand response participation in the CAISO markets.<sup>1</sup> These enhancements result from the third phase of the CAISO’s energy storage and distributed energy resource stakeholder initiative (“ESDER”). The CAISO proposes two sets of enhancements:

- A. Providing hourly and fifteen-minute scheduling options for demand response resources in the real-time market; and
- B. Removing the requirement that demand response resources aggregate within a single load-serving entity (“LSE”), and converting the net benefits test from a settlement adjustment to a bid floor.

The first set of proposed enhancements allows demand response resources to submit hourly and fifteen-minute block bids in the CAISO’s real-time markets, options currently available to “intertie resources” that import and export through the CAISO balancing authority area (“BAA”). Many demand response resources in

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<sup>1</sup> References herein to “energy storage” generally refer to battery, flywheel, compressed air, and other emerging technologies, but not Pumped-Storage Hydro Units, which already participate in CAISO markets and have distinct operating rules and procedures.

The CAISO submits this filing pursuant to section 205 of the Federal Power Act, 16 U.S.C. § 824d. Capitalized terms not otherwise defined herein have the meanings set forth in the CAISO tariff, and references to specific sections, articles, and appendices are references to sections, articles, and appendices in the current CAISO tariff and revised or proposed in this filing, unless otherwise indicated.

California are air conditioner cycling and other consumer programs. They frequently struggle to respond to real-time dispatch on a five-minute basis, with only two to three minutes notification before the dispatch interval. Enabling them to be dispatched in 15- or 60-minute intervals—like intertie resources—will provide notification farther in advance and lengthen minimum event windows. These enhancements will respect demand response resources' constraints, allowing them to participate in the real-time markets more effectively. These enhancements will thus aid CAISO dispatches' efficacy.

The second set of enhancements also removes hurdles to demand response participation in the CAISO markets. The CAISO proposes to remove the requirement that end-user aggregations forming single demand response resources all be located within a single LSE's territory. Market participants have expressed difficulty meeting or maintaining the CAISO's minimum 100 kW capacity participation threshold for demand response aggregations due to the migration of end users to new, smaller LSEs such as Community Choice Aggregators ("CCAs"). The single LSE requirement resulted from the CAISO's need to settle the resources and corresponding LSE load in instances when demand response was not beneficial to the market under Order No. 745's net benefits test.<sup>2</sup> To enable demand response participation across multiple LSEs, the CAISO proposes to convert the net benefits test's enforcement mechanism from a settlement adjustment to a bid floor. The net benefits test will thus determine the minimum value for demand response resource bids, ensuring that demand response bids are market-beneficial in the first instance, and enabling demand response resources to aggregate across multiple LSEs.

The CAISO notes that each set of revisions is separate and not dependent on the other, from both a substantive and an implementation perspective. The CAISO has filed them together because they were part of the same stakeholder process, because they represent enhancements to demand response, and because a single filing promotes administrative efficiency. The CAISO respectfully requests that the Commission approve the proposed revisions with an effective date of November 13, 2019. Additionally, the CAISO respectfully requests that the Commission waive the notice requirement provided in the Commission's regulations.

## **II. Background**

In 2015 the CAISO began the first phase of its ESDER initiative, which sought to solve the CAISO-related issues identified in the California Energy Storage Roadmap and solicit additional suggestions from stakeholders on issues related to

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<sup>2</sup> *Demand Response Compensation in Organized Wholesale Energy Markets*, 134 FERC ¶ 61,187 (2011) ("Order No. 745"), *order on reh'g and clarification*, 137 FERC ¶ 61,215 (2011) ("Order No. 745-A").

energy storage, demand response, distributed resources, and behind-the-meter resources. This first phase focused on the non-generator resource model (used by storage resources), demand response enhancements, and clarifications of the rules for “multiple-use applications,” namely resources capable of providing service both to end-use customers and to the wholesale electricity markets.<sup>3</sup> The Commission approved the CAISO’s initial ESDER reforms in 2016.<sup>4</sup>

In 2016 the CAISO began phase two of its ESDER initiative. Phase two focused on (1) providing three new demand response evaluation methodologies; (2) clarifying the metering, settlement, and netting rules regarding station power for energy storage resources; and (3) revising the fuel price calculation in the CAISO’s net benefits test to expand the relevant natural gas indices inputs. The Commission approved these reforms in 2018.<sup>5</sup>

The CAISO began phase three of its ESDER initiative in 2017. Phase three focused on demand response enhancements, electric vehicle charging station participation in demand response programs, and a new load-shift product. The demand response enhancements are contained in the instant filing, and the CAISO intends to submit the other proposals to the Commission in 2020.

The CAISO currently is conducting phase four of the ESDER initiative.<sup>6</sup> Phase four has focused on (1) biddable state-of-charge targets, (2) market power mitigation for energy storage, (3) demand response enhancements, and (4) multiple-use applications.<sup>7</sup> In addition, the CAISO has worked closely with the Commission on national energy storage and distributed energy resource reforms. The CAISO has participated in numerous technical conferences and submitted many comments on Commission storage proceedings, including Order No. 841.

### **III. Proposed Tariff Revisions**

#### **A. Real-time Scheduling for Demand Response**

##### **1. Current Framework – CAISO Markets**

The CAISO administers both day-ahead and real-time wholesale electricity markets. Although the day-ahead market only includes the CAISO balancing

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<sup>3</sup> The examination of multiple-use application rules did not result in tariff revisions.

<sup>4</sup> *California Independent System Operator Corp.*, 156 FERC ¶ 61,110 (2016).

<sup>5</sup> *See California Independent System Operator Corp.*, Letter Order, Docket No. ER18-2242-000 (Oct. 24, 2018).

<sup>6</sup> *Id.*

<sup>7</sup> *See* CAISO Draft Final Proposal on ESDER Phase 3, *available at* <http://www.aiso.com/Documents/DraftFinalProposal-EnergyStorage-DistributedEnergyResourcesPhase3.pdf>.

authority area, the real-time market extends to balancing authority areas participating in the energy imbalance market (“EIM”), which includes the CAISO and several EIM entities.

The interrelated day-ahead and real-time markets ensure electricity supply is sufficient to satisfy demand in the entire region while maintaining the reliability of the transmission system. Both markets commit resources and schedule and dispatch them for energy, while respecting transmission security, resource characteristics, and transmission scheduling limits. The markets produce optimal schedules, dispatches, and locational marginal prices (“LMPs”) used for financial settlement. The day-ahead market produces schedules for the CAISO balancing authority area, for individual internal and external resources and for non-resource-specific bids for energy at the CAISO interties, *i.e.*, imports and exports. The real-time market also produces schedules and dispatches for these resources. These schedules and financial settlements are hourly in the day-ahead market. The real-time market consists of 15-minute market (“FMM”) schedules settled relative to day-ahead market schedules, and the 5-minute real-time dispatch (“RTD”) settled relative to 15-minute schedules. Any difference between the resource’s meter and its 5-minute real-time dispatch is settled at the 5-minute RTD price.

## 2. Current Framework – Demand Response

Load, storage, and generation resources frequently participate in the CAISO markets via demand response models. These resources can be transmission-connected, distribution-connected, or behind a retail meter. These resources participate in the CAISO markets by providing load curtailment through one of the CAISO’s two demand response models: proxy demand resources or reliability demand response resources.<sup>8</sup> A proxy demand resource is an economically dispatched demand response resource, and a reliability demand response resource is dispatched only when the CAISO’s system is near or in a system emergency.<sup>9</sup>

Although demand response resources successfully participate in the CAISO markets, the CAISO and its stakeholders always seek to improve their ability to effectively participate as supply side resources. Demand response resources now include a mix of diverse consumers including industrial plants with load equal to a city, residential air conditioners and appliances, commercial air conditioners, electric vehicle charging stations, mills, refineries, farms, labs, and schools. Pacific Gas & Electric Company even offers specialized demand response consulting for

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<sup>8</sup> For concision, this letter will simply refer to both as demand response resources.

<sup>9</sup> See *California Independent System Operator Corp.*, 144 FERC ¶ 61,047 at PP 8 *et seq.* (2013) (explaining a reliability demand response resource); see also Section 4.13.5 of the CAISO tariff (outlining the characteristics of proxy demand resources and reliability demand response resources).

wineries.<sup>10</sup> A large and growing share of demand response resources have their own onsite load, generating capacity, and batteries.

Because proxy demand resources generally consist of aggregated retail customers like air conditioner cycling programs, manufacturing, and process management, they often lack conventional generation's near-instantaneous ability to produce energy, increase output, decrease output, stop producing, and start again. Scheduling coordinators may receive a real-time schedule only two to three minutes before the dispatch interval. But after they receive their real-time schedule from the CAISO, scheduling coordinators often require more than three minutes to dispatch the end users that comprise the proxy demand resource.

Proxy demand resources also can be constrained in their ability to be dispatched on and off more than once in a single hour. Demand response providers have conveyed that the average consumer is unlikely to tolerate multiple demand response events in a given hour if it impacts comfort or processes.

As a result, many demand response providers have expressed that the five-minute intervals in the CAISO's real-time market do not provide adequate notification for certain proxy demand resources. They frequently have insufficient time between when they receive their real-time dispatch schedule from the CAISO and when they have to respond.<sup>11</sup> Additionally, demand response providers have expressed that the CAISO's maximum daily energy limit and minimum run time Master File parameters do not accurately capture how frequently certain proxy demand resources can be used within an hour. If these resources are dispatched to provide demand response energy,<sup>12</sup> they need to run for more than five minutes, or they need to avoid being turned back on five minutes after they are turned off. Essentially, demand response providers need more optionality to accurately reflect their proxy demand resources' constraints to participate effectively in the real-time market.

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<sup>10</sup> See [https://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/agriculture/06\\_wineres\\_fs\\_v4\\_final.pdf](https://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/agriculture/06_wineres_fs_v4_final.pdf).

<sup>11</sup> Today, the CAISO market systems will issue a start-up instruction to a resource to their Pmin, often 0 MW, well in advance of the commitment hour in the real-time market. This commitment ensures both start-up and minimum runtime constraints are met; however, because the resource is considered "running" at a Pmin of 0 MW, it is available for dispatch whenever the resource's energy bid is economic. This can result in 5-minute dispatch instructions that may have only a 2.5-minute notification before the interval. This notification is infeasible for many PDRs.

<sup>12</sup> The CAISO is using "provide demand response energy" in the sense that they have a positive energy schedule. The CAISO understands that demand response resources generally do not put energy onto the grid, but curtail demand that would otherwise occur.

### 3. Proposed Tariff Revisions

The issues described above are not new to the real-time market: The CAISO has faced very similar issues for intertie resources.<sup>13</sup> Because intertie resources schedule energy to flow across BAAs, they frequently require additional time to secure transmission rights across the relevant transmission paths, and to submit electronic tags (“eTags”) to inform the BAAs in compliance with reliability standards. Although proxy demand resources do not face the exact same constraints, the constraints they face present the same challenges in the five-minute market. The CAISO thus proposes to extend the longer notification and scheduling options available for intertie resources to proxy demand resources.<sup>14</sup> Specifically, the CAISO proposes to allow proxy demand resources to specify in the Master File whether the resource will bid and be dispatched in the real-time market in (i) hourly intervals, (ii) 15-minute intervals, or (iii) five-minute intervals.<sup>15</sup> This election must be based on real operational and technical constraints, consistent with the CAISO’s requirements for all Master File parameters.<sup>16</sup> If demand response resources do not submit an election, the CAISO will use five-minute intervals as the default.<sup>17</sup> Scheduling coordinators for both new and existing resources can request to modify their Master File parameters at any time, and the CAISO will incorporate their modifications between five and eleven business days.<sup>18</sup>

Scheduling Coordinators electing to submit hourly block bids for proxy demand resources will receive binding schedules with the same MWh award for each of the four 15-minute intervals within the trading hour.<sup>19</sup> This will provide scheduling coordinators with notification further in advance of dispatch, and resources cannot be dispatched up and down (and back up) repetitively within an hour. Scheduling coordinators will receive these schedules through the CAISO’s hour-ahead scheduling process (“HASP”) between 45 and 60 minutes before the

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<sup>13</sup> See, e.g., *California Independent System Operator Corp.*, 146 FERC ¶ 61,204 (2014).

<sup>14</sup> Reliability demand response resources do not require additional real-time bidding options because the CAISO only dispatches them in real-time under specific operating parameters. See Section 4.13.5.3 of the CAISO tariff.

<sup>15</sup> Proposed Section 4.13.3 of the CAISO tariff. The CAISO also notes that the existing CAISO tariff uses the term Hourly Block in several places, but does not provide a definition for this capitalized term. The CAISO thus proposes to define Hourly Blocks in Appendix A to the CAISO tariff as “A Bid or Schedule in the Real-Time Market from eligible resources for the same MWh quantity over an entire Trading Hour. Binding Hourly Block Schedules result in contiguous FMM Schedules.”

<sup>16</sup> See Section 4.6.4 of the CAISO tariff.

<sup>17</sup> *Id.*

<sup>18</sup> Section B.1 of the Business Practice Manual for Market Instruments.

<sup>19</sup> Proposed Section 30.6.1.1 of the CAISO tariff.

dispatch hour.<sup>20</sup> Because the LMP for each 15-minute interval will not be determined until the interval itself, the resource will be a price taker for each fifteen-minute interval. Consistent with the CAISO's rules for intertie resources, proxy demand resources that elect to use hourly block bids will not be eligible for bid cost recovery.<sup>21</sup>

Scheduling coordinators electing to submit 15-minute block bids for proxy demand resources will receive binding schedules in the CAISO's fifteen-minute market.<sup>22</sup> Scheduling coordinators will receive these schedules 22.5 minutes before the dispatch interval.<sup>23</sup> These resources could have their schedules adjusted within a single hour, but only resources capable of doing so should elect to bid and be scheduled in the FMM. The CAISO will settle these schedules at the 15-minute market LMP.<sup>24</sup> Fifteen minute bids will be eligible for bid cost recovery, consistent with current practice.

Providing proxy demand resources with bidding options solves both of the issues described above: (1) scheduling coordinators will receive their schedules well before the dispatch interval, providing sufficient time to ensure an accurate response to dispatch; and (2) proxy demand resources electing to be scheduled in hourly blocks cannot be dispatched "on and off" within an hour. Proxy demand resources with the longest time constraints can elect to be dispatched hourly. More flexible but constrained resources can elect to be dispatched on a 15-minute basis. And the most flexible resources can continue to use the 5-minute market. The Commission should approve these enhancements as just and reasonable. They leverage existing market functionalities for resources that face similar constraints. These revisions will help demand response resources participate more effectively in the CAISO's real-time markets, which will mitigate the extent to which many struggle today and thereby improve dispatch efficacy. Stakeholders supported the

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<sup>20</sup> Section 34.2.4 of the CAISO tariff.

<sup>21</sup> Proposed Section 11.6.4 of the CAISO tariff. See *California Independent System Operator Corp.*, 146 FERC ¶ 61,204 at P 59 (2014) ("We accept CAISO's proposal to provide bid cost recovery only for intertie bids that offer bids into the 15-minute market or use dynamic transfers as just and reasonable. An important goal of the revised market design, and one of the objectives of Order No. 764, is to encourage flexible scheduling on 15-minute intervals. We find that providing bid cost recovery for hourly bids would detract from this objective and effectively reinstate the prior 'bid or better' rule, which created gaming opportunities and resulted in substantial uplift costs. We find that CAISO has provided hourly schedulers with adequate opportunities to address any risks by, for example, participating in the day-ahead market or by reflecting the impact of their ineligibility for bid cost recovery in their hourly intertie bids.") Likewise, settlement charges that account for ramping and imbalances within an hour will not be applied to hourly resources. Proposed Section 11.6.4 of the CAISO tariff.

<sup>22</sup> Section 34.4 of the CAISO tariff.

<sup>23</sup> *Id.*

<sup>24</sup> Section 11.5 of the CAISO tariff.

CAISO's proposed revisions.

## **B. Net Benefits Test and Single LSE Requirement**

### **1. Current Framework**

Order No. 745 required ISO/RTOs to establish a net benefits test “to ensure that the overall benefit of the reduced LMP that results from dispatching demand response resources exceeds the costs of dispatching and paying LMP to those resources.”<sup>25</sup> As directed by Order No. 745, the CAISO's net benefits test establishes threshold prices for peak and off-peak periods at the points where the dispatch of demand response results in a net decrease in the cost of energy.<sup>26</sup>

To comply with Order No. 745, the CAISO originally proposed to use the net benefits test to establish a bid floor for demand response resources. However, the Commission found that this proposal was more appropriate for a Section 205 filing than a compliance filing.<sup>27</sup> The CAISO thus removed the proposal from its compliance filing, which the Commission accepted.<sup>28</sup> The CAISO was then left with a net benefits test whose effects only applied to load serving entities, not demand response providers. When a proxy demand resource provides demand response energy at an LMP below the net benefits test's market clearing price, it is still fully compensated at the LMP. The only consequence of providing demand response energy where the LMP is below the net benefits test's market clearing price is an allocation of costs to load. The CAISO applies a settlement adjustment known as the “default load adjustment” or “DLA.”<sup>29</sup> If a proxy demand resource is dispatched to provide demand response energy below the market clearing price established by the net benefits test, the amount of demand response energy it provided will be charged to the corresponding LSE as uninstructed imbalance energy, while the proxy demand resource is still settled for all of its demand response energy at the LMP.<sup>30</sup>

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<sup>25</sup> *California Independent System Operator Corp.*, 144 FERC ¶ 61,046 at P 2 (2013).

<sup>26</sup> *California Independent System Operator Corp.*, 137 FERC ¶ 61,217 at P 28 (2011); Section 30.6.3 of the CAISO tariff. The CAISO establishes these prices by generating an on-peak and off-peak supply curve each month that depicts system-wide aggregated power supplies and different offer prices in the CAISO markets. The CAISO collects its supply curve data for the month using data from the previous year for that month. Pursuant to Order No. 745, the CAISO then adjusts supply curve data to reflect differences in resource availability and fuel prices between the target month and the reference month to ensure comparability.

<sup>27</sup> *California Independent System Operator Corp.*, 137 FERC ¶ 61,217 at P 32 (2011).

<sup>28</sup> *California Independent System Operator Corp.*, 144 FERC ¶ 61,046 at P 23 (2013).

<sup>29</sup> Section 30.6.3 of the CAISO tariff.

<sup>30</sup> Section 11.5.2.4 of the CAISO tariff.

In practice, this issue rarely arises. The CAISO analyzed how frequently in 2017 it dispatched demand response resources at an LMP below the net benefits test's market clearing price, resulting in use of the default load adjustment. The CAISO found that it applied the default load adjustment only in four percent of the relevant settlement intervals in 2017. The overwhelming majority of the time, the LMP was above the market clearing price. Even where it was below, the settlement adjustments to load resulting from the default load adjustment were *de minimis*.

The CAISO believes these trends will continue. Demand response resources generally submit relatively higher bids. The CAISO Department of Market Monitoring's 2018 Annual Report noted that "proxy demand response capacity was primarily offered into the day-ahead market at bid prices over \$750/MWh and into the real-time market near the \$1,000/MWh bid cap."<sup>31</sup> As a result, they are dispatched when the LMP is relatively high. Moreover, the net benefits test generally produces a very low market clearing price. For example, the market clearing price for September 2019 will be \$0/MWh.

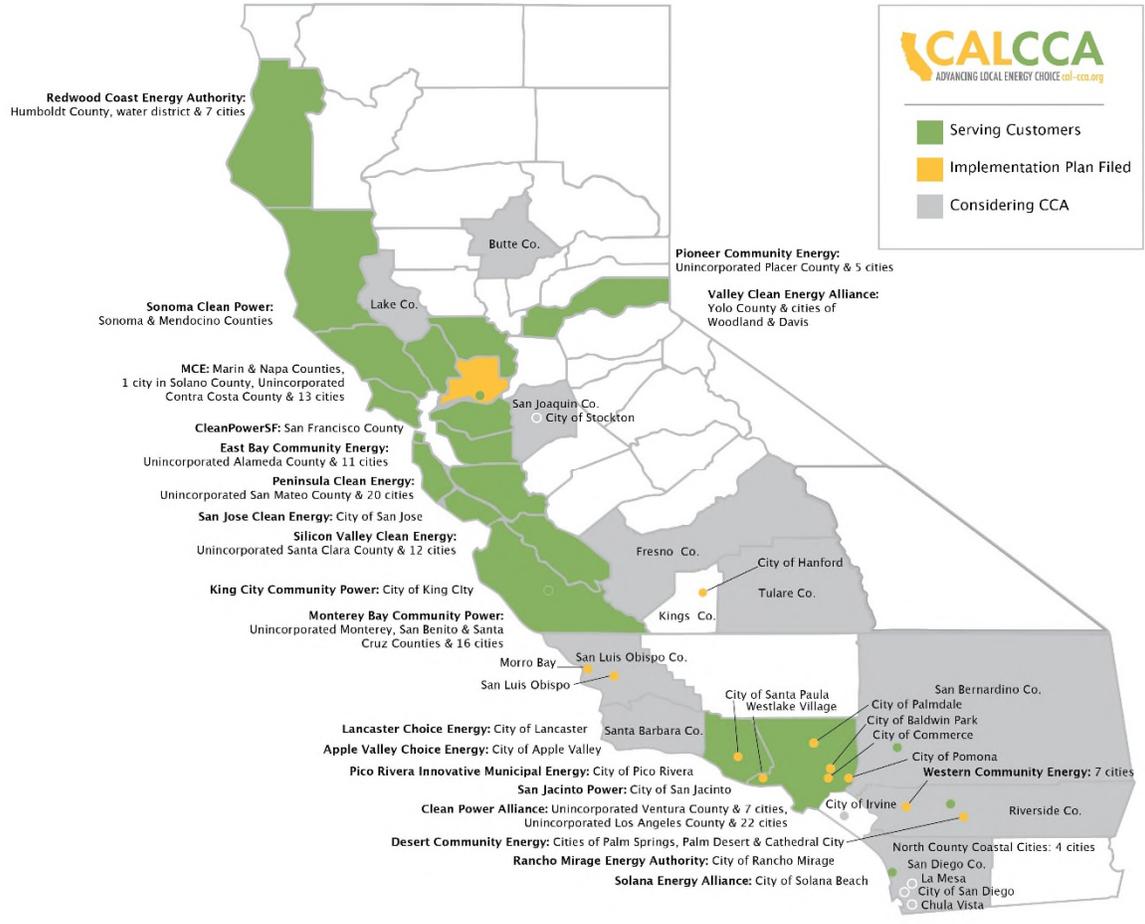
In any case, the current use of the net benefits test and the default load adjustment results in an obstacle independent of the market economics. Because demand response energy below the market clearing price is assessed to the LSE, the CAISO has required that any end user aggregations comprising a demand response resource be located within the same LSE territory. Without this requirement, the default load adjustment would be too complex to manage: The CAISO could not reasonably determine which end users that comprise a single demand response resource responded to a given dispatch (and to what extent) to allocate costs proportionately to each LSE. Moreover, demand response providers do not produce individual load baselines for each end user at the settlement-interval level, and thus the CAISO would be unable to determine the demand response energy resulting from each end user in each LSE in a single proxy demand resource.

The requirement to aggregate within a single LSE territory has become increasingly challenging in California. The number of LSEs in California has grown exponentially in recent years with the migration of load from investor owned utilities

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<sup>31</sup> CAISO Department of Market Monitoring, 2018 Annual Report on Market Issues and Performance, p. 42, available at <http://www.caiso.com/Documents/2018AnnualReportonMarketIssuesandPerformance.pdf> ("While the total amount of registered capacity and energy bids from demand response increased significantly between 2017 and 2018, the additional proxy demand response capacity was primarily offered into the day-ahead market at bid prices over \$750/MWh and into the real-time market near the \$1,000/MWh bid cap. The incremental bid capacity in 2018 was from both supply plan and non-supply plan resources. The majority of demand response capacity remained concentrated at the top of the resource supply stack and was infrequently dispatched in the day-ahead and real-time markets").

to CCAs. The following map illustrates CCAs existent today and potentially coming soon.<sup>32</sup>



Many of these CCAs do not have demand response programs. Others offer demand response programs, but may lack enough participants within their smaller areas to meet the CAISO's 100 kW minimum capacity requirement for a demand response resource. LSEs' disaggregation has made demand response end users' aggregation within a single LSE much more difficult. As a result, many willing demand response participants have been stranded, causing demand response providers to request that the CAISO reevaluate the requirement to aggregate within a single LSE.

<sup>32</sup> CALCCA, "Impact," (August 21, 2019), <https://cal-cca.org/cca-impact/>.

## 2. Proposed Revisions

The CAISO proposes to remove the requirement that an individual demand response resource's multiple end users must be associated with a single LSE.<sup>33</sup> This will remove a real (and growing) barrier to entry for demand response participants in the CAISO markets.

To enable such participation and still comply with Order No. 745's requirement to use the net benefits test, the CAISO proposes to eliminate the default load adjustment and replace it with a bid floor.<sup>34</sup> As explained above, the default load adjustment is unworkable without the single LSE requirement, but under Order No. 745, the CAISO only should "pay[] demand response depending on whether it satisfies the net benefits test."<sup>35</sup> The CAISO's proposed bid floor based on the net benefits test price threshold will ensure in the first instance that demand response "produces a sufficient reduction in LMP to cover the increased billing costs imposed on remaining customers"<sup>36</sup> while allowing inter-LSE participation. The CAISO will implement the bid floor in its Software Infrastructure Business Rules ("SIBR") web user interface, which is the program scheduling coordinators use to submit bids.<sup>37</sup> SIBR will automatically reject demand response bids below the net benefits test's published market clearing price for that month. Scheduling coordinators can then re-submit bids at or above the market clearing price so long as the bid window has not closed.<sup>38</sup>

As explained above, the CAISO's analysis of settlement data demonstrates that the proposed bid floor is unlikely to affect demand response resources' ability to bid and be dispatched in the CAISO markets. The CAISO's market clearing price generally remains well below demand response resources' bids. Moreover, demand response resources will know in advance whether their bids will be accepted because their scheduling coordinators can obviously determine whether the bids exceed the published market clearing price. This will be more practical and transparent than current practices, which hinge on the LMP instead of bids.

Stakeholders strongly supported this proposal. Demand response providers see the single-LSE requirement as a hurdle that grows higher every day and

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<sup>33</sup> Proposed Section 4.13.2 of the CAISO tariff.

<sup>34</sup> Proposed Sections 11.5.2.4 and 30.6.3 of the CAISO tariff.

<sup>35</sup> Order No. 745-A at P 91.

<sup>36</sup> *Id.*

<sup>37</sup>

[https://www.caiso.com/Documents/SIBR\\_SchedulingCoordinatorUserGuideFrameworkUpgrade.pdf](https://www.caiso.com/Documents/SIBR_SchedulingCoordinatorUserGuideFrameworkUpgrade.pdf).

<sup>38</sup> The CAISO does not expect this to happen unless a scheduling coordinator submits bids below the published market clearing price with little or no time before the bidding window has closed.

already impedes demand response participation. Removing this hurdle will enable greater participation in the CAISO markets while ensuring that demand response participation is market efficient. The Commission should approve the CAISO's proposal as just and reasonable.

### **C. Clarifications**

The CAISO also proposes to make some tariff clarifications in this filing that do not affect current practice or policy. In preparing this filing, the CAISO observed that several demand response resource bidding rules were in section 4 of the CAISO tariff ("Roles and Responsibilities" rather than section 30 ("Bid and Self-schedule submission in CAISO Markets"). The CAISO proposes to remove the provisions out of place in section 4 and state them clearly in section 30.<sup>39</sup>

Additionally, some provisions regarding demand response resource bidding rules referred to submitting "Bids," which can include self-schedules, rather than "Economic Bids," which cannot. Demand response resources can only self-schedule energy or ancillary services in certain circumstances, so the CAISO proposes to clarify the provisions that vaguely refer to demand response resources submitting "Bids."<sup>40</sup> The CAISO's proposed language specifies clearly how and when demand response resources can submit Economic Bids and self-schedules for energy and ancillary services in the day-ahead and real-time markets.<sup>41</sup>

The CAISO also proposes to revise CAISO tariff section 4.13.2 o to remove inadvertent references to "Locations," which are a defined term in the CAISO tariff that refers to Pricing Nodes. Section 4.13.2 describes how demand response providers register their resources with the CAISO. This registration process allows the CAISO to ensure that demand response providers do not register the same end users as other demand response providers. As such, the references to "Locations" should simply be "locations." This will ensure demand response providers continue to register end users at the retail service account level and not the nodal level, which would be so large it would be unhelpful.

Finally, the existing CAISO tariff refers to the term "Hourly Block" in several places,<sup>42</sup> but does not define this capitalized term. The CAISO thus proposes to define Hourly Blocks in Appendix A to the CAISO tariff as "A Bid or Schedule in the Real-Time Market from eligible resources for the same MWh quantity over an entire Trading Hour. Binding Hourly Block Schedules result in contiguous FMM Schedules." This definition conforms to the CAISO's current use of the term, and

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<sup>39</sup> Proposed Sections 4.13.1, 30.6.1, and 30.6.2 of the CAISO tariff.

<sup>40</sup> Proposed Sections 30.6.1, 30.6.1.1, and 30.6.2.

<sup>41</sup> *Id.*

<sup>42</sup> See, e.g., Section 30.5.1(q) - (u), 30.5.2.7, and 30.5.7.1.

how the CAISO proposes to use it for demand response resources in the instant filing.

#### **IV. Stakeholder Process**

The stakeholder process that resulted in this filing included:

- Five papers produced by the CAISO;
- Nine stakeholder meetings and conference calls to discuss the CAISO papers and the draft tariff provisions; and
- Eight opportunities to submit written comments on the CAISO issue papers and the draft tariff provisions.<sup>43</sup>

The policies resulting in these proposed tariff revisions received broad stakeholder support. They were presented to the CAISO Board of Governors on August 28, 2018, where the Board voted unanimously to authorize this filing.

#### **V. Effective Date and Request for Waiver of Notice Period**

The CAISO respectfully requests that the Commission waive its notice requirements,<sup>44</sup> and approve the proposed revisions within 60 days, with an effective date of November 13, 2019. Approval within this timeline will provide the CAISO and its software developers with the requisite certainty to develop, test, and implement the enhanced software—pursuant to a Commission order—before the tariff revisions go into effect on November 13. As such, good cause exists to grant waiver of the Commission’s notice requirements and approve the CAISO’s requested effective date.

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<sup>43</sup> All stakeholder materials are available on the CAISO website: [http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorage\\_DistributedEnergyResources.aspx](http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorage_DistributedEnergyResources.aspx).

<sup>44</sup> Specifically, pursuant to Section 35.11 of the Commission’s regulations (18 C.F.R. § 35.11), the CAISO requests waiver of the notice requirements set forth in Section 35.3 of the Commission’s regulations (18 C.F.R. § 35.3).

## **VI. Communications**

Pursuant to Rule 203(b)(3) of the Commission's Rules of Practice and Procedure,<sup>45</sup> the CAISO requests that all correspondence, pleadings, and other communications regarding this filing should be directed to the following:

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General Counsel  
Sidney L. Mannheim  
Assistant General Counsel  
William H. Weaver  
Senior Counsel  
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## **VII. Service**

The CAISO has served copies of this filing on the California Public Utilities Commission, the California Energy Commission, and all parties with scheduling coordinator agreements under the CAISO tariff. In addition, the CAISO has posted a copy of the filing on the CAISO website.

## **VIII. Contents of Filing**

Besides this transmittal letter, this filing includes these attachments:

Attachment A	Clean CAISO tariff sheets incorporating this tariff amendment
Attachment B	Red-lined document showing the revisions in this tariff amendment
Attachment C	Draft final proposal
Attachment D	Board memoranda

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<sup>45</sup> 18 C.F.R. § 385.203(b)(3).

**IX. Conclusion**

For the reasons set forth above, the CAISO respectfully requests that the Commission accept these proposed tariff revisions with an effective date of November 13, 2019.

Respectfully submitted,

/s/ William H. Weaver

Roger E. Collanton  
General Counsel  
Sidney L. Mannheim  
Assistant General Counsel  
William H. Weaver  
Senior Counsel

Counsel for the California Independent  
System Operator Corporation

**Attachment A – Clean Tariff**

**Energy Storage and Distributed Energy Resources Phase 3 Tariff Amendment**

**California Independent System Operator Corporation**

#### **4.13 DRPs, RDRRs, and PDRs**

##### **4.13.1 Relationship Between CAISO and DRPs**

Consistent with Section 30.6, the CAISO shall only accept Bids from Reliability Demand Response Resources and Proxy Demand Resources if such Reliability Demand Response Resources or Proxy Demand Resources are represented by a Demand Response Provider that has entered into a Demand Response Provider Agreement with the CAISO, has accurately provided the information required in the Demand Response System, has satisfied all Reliability Demand Response Resource or Proxy Demand Resource registration requirements, and has met standards adopted by the CAISO and published on the CAISO Website. Reliability Demand Response Resources and Proxy Demand Resources may not participate in a Distributed Energy Resource Aggregation. The CAISO shall not accept submitted Bids for Energy or Ancillary Services from a Demand Response Provider other than through a Scheduling Coordinator, which Scheduling Coordinator may be the Demand Response Provider itself or another entity. Proxy Demand Response Resources providing Ancillary Services must submit Meter Data for the interval preceding, during, and following the Trading Interval(s) in which they were awarded Ancillary Services for the purposes of determining settlement pursuant to Section 8.10.8.

##### **4.13.2 Applicable Requirements for RDRRs, PDRs and DRPs**

A single Demand Response Provider must represent each Reliability Demand Response Resource or Proxy Demand Resource and may represent more than one (1) Reliability Demand Response Resource or Proxy Demand Resource. Each Reliability Demand Response Resource or Proxy Demand Resource that is not within a MSS must be associated with a single Utility Distribution Company. A Demand Response Provider may be, but is not required to be, a Load Serving Entity or a Utility Distribution Company. Each Reliability Demand Response Resource or Proxy Demand Resource is required to be located in a single Sub-LAP. All underlying locations of a Reliability Demand Response Resource or Proxy Demand Resource must be located in a single Sub-LAP. Each Demand Response Provider is required to satisfy registration requirements and to provide information to allow the CAISO to establish performance evaluation methodologies in accordance with Section 4.13.4 and the applicable Business Practice Manuals. Registration of a location for participation in Reliability Demand Response Resources or Proxy Demand Resources requires the approval of the CAISO resulting from its registration process.

As part of the submitted registration process, both the appropriately Demand Response Provider designated Load Serving Entity and Utility Distribution Company will have an opportunity to review the location detail and provide comments with regard to its accuracy. Disputes regarding the acceptances or rejections of a registration of a location shall be undertaken with the applicable Local Regulatory Authority and shall not be arbitrated or in any way resolved through a CAISO dispute resolution mechanism or process. A location cannot be registered to both a Reliability Demand Response Resource and a Proxy Demand Resource for the same Trading Day.

#### **4.13.3 Identification of RDRRs and PDRs**

Each Demand Response Provider shall provide data, as described in the Business Practice Manual, identifying each of its Reliability Demand Response Resources or Proxy Demand Resources and such information regarding the capacity and the operating characteristics of the Reliability Demand Response Resource or Proxy Demand Resource as may be reasonably requested from time to time by the CAISO. All information provided to the CAISO regarding the operational and technical constraints in the Master File shall be accurate and actually based on physical characteristics of the resources. Demand Response Providers for Proxy Demand Resources may elect to specify in the Master File how the Proxy Demand Resource will bid and be dispatched in the Real-Time Market: in (i) Hourly Blocks, (ii) fifteen (15) minute intervals, or (iii) five (5) minute intervals. If Demand Response Providers do not submit an election in the Master File, the CAISO will set five (5) minute intervals as the default.

\* \* \* \* \*

### **11.5 Real-Time Market Settlements**

\* \* \* \* \*

#### **11.5.2.4 [Not used]**

\* \* \* \* \*

#### **11.6.4 Settlements of Proxy Demand Resources in the Real-Time Market**

The CAISO will calculate RTM Schedules and Awards for Proxy Demand Resources at the relevant RTM LMP at the relevant Scheduling Point consistent with Section 11.5. The portion of an Hourly Block Schedule for Energy that becomes financially binding will constitute an FMM Schedule. A cleared Economic Hourly Block Bid is not eligible for Bid Cost Recovery. Ramping Energy Deviations, Residual Imbalance Energy, and Standard Ramping Energy do not apply to Proxy Demand Resources with Hourly Block or FMM Schedules.

#### **11.6.5 Settlement of Distributed Energy Resource Aggregations**

Settlements for Energy provided by a Distributed Energy Resource Provider from a Distributed Energy Resource Aggregation shall be based on the applicable PNode or Aggregated PNode of the Distributed Energy Resource Aggregation. For Distributed Energy Resource Aggregations comprising a single PNode, settlement for Energy transactions would reflect the LMP at that PNode. For Distributed Energy Resource Aggregations comprising multiple PNodes settlement for Energy transactions would be the weighted average LMP of the PNode(s) based on the applicable Generation Distribution Factors submitted through the Distributed Energy Resource Aggregation's Bid or as registered in the Master File. Consistent with the provisions of Section 11.5.2, the CAISO will impose UIE on a Distributed Energy Resource Provider if the Distributed Energy Resource Provider's Distributed Energy Resource Aggregation does not follow a Dispatch Instruction.

#### **11.6.6 Settlements of Non-Generator Resources**

Settlements for Energy generated or consumed by a Non-Generator Resource or a resource using Non-Generator Resource Generic Modeling functionality will reflect the applicable PNode or Aggregated PNode. For such resources comprising a single PNode, settlement for Energy transactions will reflect the LMP at that PNode. For such resources comprising multiple PNodes settlement for Energy transactions will reflect the weighted average LMP of the PNode(s) based on the applicable Generation Distribution Factors submitted through the resources' Bid or as registered in the Master File. Consistent with the provisions of Section 11.5.2, the CAISO will impose UIE on a resource's Scheduling Coordinator if the resource does not follow a Dispatch Instruction. When operating in a negative range between PMin and 0, the CAISO will not consider a Non-Generator Resource or a resource using Non-Generator Resource

Generic Modeling functionality as Measured Demand so long as the resource can generate Energy. If a Non-Generator Resource operates solely as dispatchable demand response, the CAISO will treat the resource as Measured Demand.

\* \* \* \* \*

## **30.6 Bidding and Scheduling of PDRs and RDRRs**

### **30.6.1 Bidding and Scheduling of PDRs**

Unless otherwise specified in the CAISO Tariff and applicable Business Practice Manuals, and subject to Section 30.6.3, the CAISO will treat Bids for Energy and Ancillary Services on behalf of Proxy Demand Resources like Bids for Energy and Ancillary Services on behalf of other types of supply resources. The CAISO will only accept the following types of Bids from Proxy Demand Resources:

- (i) Economic Bids for Energy or Ancillary Services;
- (ii) submissions to Self-Provide Ancillary Services;
- (iii) submissions of Energy Self-Schedules from Proxy Demand Resources that have provided Submissions to Self-Provide Ancillary Services;
- (iv) submissions of Energy Self-Schedules in the Real-Time Market up to the Proxy Demand Resource's Day-Ahead Market Schedule in the same Trading Hour; and
- (v) RUC Availability Bids.

A Scheduling Coordinator for a Demand Response Provider representing a Proxy Demand Resource may Self-Provide Ancillary Services for which it is certified. The Demand Response Provider's Demand Response Services for Proxy Demand Resources will be bid separately and independently from the LSE's underlying Demand Bid.

#### **30.6.1.1 Bidding and Scheduling of PDRs in the Real-Time Market**

Pursuant to Section 4.13.3, Scheduling Coordinators for Proxy Demand Resources may submit Economic Bids for Energy and Ancillary Services in the Real-Time Markets. Pursuant to Section 30.5.1(s), Scheduling Coordinators for Proxy Demand Resources may submit Economic Hourly Block Bids to be considered in the HASP, and to be accepted as binding Schedules with the same MWh award for each of

the four FMM intervals. A cleared Economic Hourly Block Bid is not eligible for Bid Cost Recovery. Scheduling Coordinators for Proxy Demand Resources may not submit Economic Hourly Block Bids with an Intra-Hour Option.

### **30.6.2 Bidding and Scheduling of RDRRs**

Unless otherwise specified in the CAISO Tariff and applicable Business Practice Manuals, and subject to Section 30.6.3, the CAISO will treat Bids for Energy on behalf of Reliability Demand Response Resources like Bids for Energy on behalf of other types of supply resources. The CAISO will only accept Economic Bids for Energy from Reliability Demand Response Resources. A Scheduling Coordinator for a Demand Response Provider representing a Reliability Demand Response Resource may submit Economic Energy Bids for the Reliability Demand Response Resource only in the Day-Ahead Market and in the Real-Time Market, but may not submit Energy Self-Schedules for the Reliability Demand Response Resource, may not Self-Provide Ancillary Services from the Reliability Demand Response Resource, and may not submit RUC Availability Bids or Ancillary Service Bids for the Reliability Demand Response Resource. The Demand Response Provider's Demand Response Services for Reliability Demand Response Resources will be bid separately and independently from the LSE's underlying Demand Bid.

\* \* \* \* \*

### **30.6.3 Net Benefits Test for PDRs or RDRRs**

In accordance with Section 11.5.2.4, the CAISO will apply a net benefits test to determine a threshold Market Clearing Price for Proxy Demand Resources and Reliability Demand Response Resources. The CAISO will not accept Proxy Demand Resource or Reliability Demand Response Resource Bids for Energy below this threshold Market Clearing Price in the CAISO Markets.

\* \* \* \* \*

### **34.4 Fifteen Minute Market**

The CAISO conducts the Fifteen Minute Market using the second interval of each RTUC run horizon as follows: (1) at approximately 7.5 minutes prior to the first Trading Hour, for T-45 minutes to T+60 minutes where the binding interval is T-30 to T-15; (2) at approximately 7.5 minutes into the current hour for T-30 minutes to T+60 minutes where the binding interval is T-15 to T; (3) at approximately 22.5 minutes into the current hour for T-15 minutes to T+60 minutes for the binding interval T to T+15; and (4) at approximately 37.5 minutes into the current hour for T to T+60 minutes for the binding interval T+15 to T+30, where T is the beginning of the next Trading Hour. In these intervals the CAISO conducts the FMM to (1) determine financially binding FMM Schedules and corresponding LMPs for all Pricing Nodes, including all Scheduling Points; (2) determine financially and operationally binding Ancillary Services Awards and corresponding ASMPs, procure required additional Ancillary Services and calculate ASMP used for settling procured Ancillary Service capacity for the next fifteen-minute Real-Time Ancillary Service interval for all Pricing Nodes, including Scheduling Points; (3) determine LAP LMPs that are the basis for settling Demand; and (4) determine FMM Uncertainty Awards. In any FMM interval that falls within a time period in which a Multi-Stage Generating Resource is transitioning from one MSG Configuration to another MSG Configuration, the CAISO: (1) will not award any incremental Ancillary Services; (2) will disqualify any Day-Ahead Ancillary Services Awards; (3) will disqualify Day-Ahead qualified Submissions to Self-Provide Ancillary Services Award, and (4) will disqualify Submissions to Self-Provide Ancillary Services in RTM. Each particular FMM market optimization produces binding settlement prices for Energy, Flexible Ramping Product, and Ancillary Services for the first FMM interval in the FMM horizon but the optimization considers the advisory results from subsequent market intervals within the FMM horizon. The CAISO settles Hourly Block Schedules from Proxy Demand Resources, Hourly Intertie Schedules, and Hourly Ancillary Services Awards accepted in the HASP as FMM Schedules and FMM Ancillary Services Awards in accordance with Section 11.5 and 11.10.1.2, respectively. In the event that a FMM run fails, the CAISO reverts to Day-Ahead Market Ancillary Services Awards and RUC Schedules results corresponding to the same interval, or the corresponding interval from the previous RTUC. The FMM will clear Supply against the CAISO Forecast Of CAISO Demand and exports. The FMM issues Energy Schedules and Ancillary Services Awards by twenty-two and a half

minutes prior to the binding fifteen-minute interval.

\* \* \* \* \*

## **Appendix A**

### **Master Definitions Supplement**

\* \* \* \* \*

#### **- FMM Schedule**

The binding output of the FMM resulting from Bids submitted to the RTM. The portion of an Hourly Block Schedule or HASP Block Intertie Schedule for either Energy or Ancillary Services that becomes financially binding shall constitute a FMM Schedule.

\* \* \* \* \*

#### **- Hourly Block**

A Bid or Schedule in the Real-Time Market from eligible resources for the same MWh quantity over an entire Trading Hour. Binding Hourly Block Schedules result in contiguous FMM Schedules.

\* \* \* \* \*

**Attachment B – Marked Tariff**

**Energy Storage and Distributed Energy Resources Phase 3 Tariff Amendment**

**California Independent System Operator Corporation**

## 4.13 DRPs, RDRRs, and PDRs

### 4.13.1 Relationship Between CAISO and DRPs

~~Consistent with Section 30.6, T~~he CAISO shall only accept Bids ~~for Energy~~ from Reliability Demand Response Resources, and ~~shall only accept Bids for Energy or Ancillary Services from~~ Proxy Demand Resources, ~~Submissions to Self-Provide Ancillary Services from Proxy Demand Resources, or submissions of Energy Self Schedules from Proxy Demand Resources that have provided Submissions to Self-Provide Ancillary Services,~~ if such Reliability Demand Response Resources or Proxy Demand Resources are represented by a Demand Response Provider that has entered into a Demand Response Provider Agreement with the CAISO, has accurately provided the information required in the Demand Response System, has satisfied all Reliability Demand Response Resource or Proxy Demand Resource registration requirements, and has met standards adopted by the CAISO and published on the CAISO Website. Reliability Demand Response Resources and Proxy Demand Resources may not participate in a Distributed Energy Resource Aggregation. The CAISO shall not accept submitted Bids for Energy or Ancillary Services from a Demand Response Provider other than through a Scheduling Coordinator, which Scheduling Coordinator may be the Demand Response Provider itself or another entity. Proxy Demand Response Resources providing Ancillary Services must submit Meter Data for the interval preceding, during, and following the Trading Interval(s) in which they were awarded Ancillary Services for the purposes of determining settlement pursuant to Section 8.10.8.

### 4.13.2 Applicable Requirements for RDRRs, PDRs and DRPs

A single Demand Response Provider must represent each Reliability Demand Response Resource or Proxy Demand Resource and may represent more than one (1) Reliability Demand Response Resource or Proxy Demand Resource. Each Reliability Demand Response Resource or Proxy Demand Resource that is not within a MSS must be associated with ~~a single Load Serving Entity and~~ a single Utility Distribution Company, ~~and each Reliability Demand Response Resource or Proxy Demand Resource that is within a MSS must be associated with a single Load Serving Entity.~~ A Demand Response Provider may be, but is not required to be, a Load Serving Entity or a Utility Distribution Company. Each Reliability Demand Response Resource or Proxy Demand Resource is required to be located in a single Sub-LAP. All underlying ~~l~~ocations of a Reliability Demand Response Resource or Proxy Demand Resource must

be located in a single Sub-LAP. Each Demand Response Provider is required to satisfy registration requirements and to provide information to allow the CAISO to establish performance evaluation methodologies in accordance with Section 4.13.4 and the applicable Business Practice Manuals.

Registration of a Location for participation in Reliability Demand Response Resources or Proxy Demand Resources requires the approval of the CAISO resulting from its registration process. As part of the submitted registration process, both the appropriately Demand Response Provider designated Load Serving Entity and Utility Distribution Company will have an opportunity to review the ~~registration~~ Location detail and provide comments with regard to its accuracy. Disputes regarding the acceptances or rejections of a registration of a Location shall be undertaken with the applicable Local Regulatory Authority and shall not be arbitrated or in any way resolved through a CAISO dispute resolution mechanism or process. A Location cannot be registered to both a Reliability Demand Response Resource and a Proxy Demand Resource for the same Trading Day.

#### **4.13.3 Identification of RDRRs and PDRs**

Each Demand Response Provider shall provide data, as described in the Business Practice Manual, identifying each of its Reliability Demand Response Resources or Proxy Demand Resources and such information regarding the capacity and the operating characteristics of the Reliability Demand Response Resource or Proxy Demand Resource as may be reasonably requested from time to time by the CAISO. All information provided to the CAISO regarding the operational and technical constraints in the Master File shall be accurate and actually based on physical characteristics of the resources. Demand Response Providers for Proxy Demand Resources may elect to specify in the Master File how the Proxy Demand Resource will bid and be dispatched in the Real-Time Market: in (i) Hourly Blocks, (ii) fifteen (15) minute intervals, or (iii) five (5) minute intervals. If Demand Response Providers do not submit an election in the Master File, the CAISO will set five (5) minute intervals as the default.

\* \* \* \* \*

## 11.5 Real-Time Market Settlements

\* \* \* \* \*

### ~~11.5.2.4 Adjustment to Metered Load to Settle Uninstructed Imbalance Energy~~[Not used]

~~For the purpose of settling Uninstructed Imbalance Energy of a Scheduling Coordinator representing a Load Serving Entity, the amount of Demand Response Energy Measurement delivered by a Proxy Demand Resource or Reliability Demand Response Resource that is also served by that Load Serving Entity and that is paid a Market Clearing Price below the threshold Market Clearing Price set forth in Section 30.6.3.1 will be added to the metered load quantity of the Load Serving Entity's Scheduling Coordinator's Load Resource ID with which the Proxy Demand Resource or Reliability Demand Response Resource is associated.~~

\* \* \* \* \*

### 11.6.4 Settlements of Proxy Demand Resources in the Real-Time Market

The CAISO will calculate RTM Schedules and Awards for Proxy Demand Resources at the relevant RTM LMP at the relevant Scheduling Point consistent with Section 11.5. The portion of an Hourly Block Schedule for Energy that becomes financially binding will constitute an FMM Schedule. A cleared Economic Hourly Block Bid is not eligible for Bid Cost Recovery. Ramping Energy Deviations, Residual Imbalance Energy, and Standard Ramping Energy do not apply to Proxy Demand Resources with Hourly Block or FMM Schedules.

### **11.6.54 Settlement of Distributed Energy Resource Aggregations**

Settlements for Energy provided by a Distributed Energy Resource Provider from a Distributed Energy Resource Aggregation shall be based on the applicable PNode or Aggregated PNode of the Distributed Energy Resource Aggregation. For Distributed Energy Resource Aggregations comprising a single PNode, settlement for Energy transactions would reflect the LMP at that PNode. For Distributed Energy Resource Aggregations comprising multiple PNodes settlement for Energy transactions would be the weighted average LMP of the PNode(s) based on the applicable Generation Distribution Factors submitted through the Distributed Energy Resource Aggregation's Bid or as registered in the Master File.

Consistent with the provisions of Section 11.5.2, the CAISO will impose UIE on a Distributed Energy Resource Provider if the Distributed Energy Resource Provider's Distributed Energy Resource Aggregation does not follow a Dispatch Instruction.

#### **11.6.65 Settlements of Non-Generator Resources**

Settlements for Energy generated or consumed by a Non-Generator Resource or a resource using Non-Generator Resource Generic Modeling functionality will reflect the applicable PNode or Aggregated PNode. For such resources comprising a single PNode, settlement for Energy transactions will reflect the LMP at that PNode. For such resources comprising multiple PNodes settlement for Energy transactions will reflect the weighted average LMP of the PNode(s) based on the applicable Generation Distribution Factors submitted through the resources' Bid or as registered in the Master File. Consistent with the provisions of Section 11.5.2, the CAISO will impose UIE on a resource's Scheduling Coordinator if the resource does not follow a Dispatch Instruction. When operating in a negative range between PMin and 0, the CAISO will not consider a Non-Generator Resource or a resource using Non-Generator Resource Generic Modeling functionality as Measured Demand so long as the resource can generate Energy. If a Non-Generator Resource operates solely as dispatchable demand response, the CAISO will treat the resource as Measured Demand.

\* \* \* \* \*

### **30.6 Bidding and Scheduling of PDRs and RDRRs**

#### **30.6.1 Bidding and Scheduling of PDRs**

Unless otherwise specified in the CAISO Tariff and applicable Business Practice Manuals, and subject to Section 30.6.3, the CAISO will treat Bids for Energy and Ancillary Services on behalf of Proxy Demand Resources like Bids for Energy and Ancillary Services on behalf of other types of supply resources. The CAISO will only accept the following types of Bids from Proxy Demand Resources:

- (i) Economic Bids for Energy or Ancillary Services;
- (ii) submissions to Self-Provide Ancillary Services;
- (iii) submissions of Energy Self-Schedules from Proxy Demand Resources that have

provided Submissions to Self-Provide Ancillary Services;

(iv) submissions of Energy Self-Schedules in the Real-Time Market up to the Proxy Demand Resource's Day-Ahead Market Schedule in the same Trading Hour; and

(v) RUC Availability Bids.

~~A Scheduling Coordinator for a Demand Response Provider representing a Proxy Demand Resource~~

~~may submit (1) Energy Bids only in the Day Ahead Market and in the Real Time Market; (2) RUC~~

~~Availability Bids; and (3) Ancillary Service Bids in the Day Ahead Market and Real Time Market for those~~

~~Ancillary Services for which the Proxy Demand Resource is certified.~~ A Scheduling Coordinator for a

Demand Response Provider representing a Proxy Demand Resource may Self-Provide Ancillary Services

for which it is certified. The Demand Response Provider's Demand Response Services for Proxy

Demand Resources will be bid separately and independently from the LSE's underlying Demand Bid.

### **30.6.1.1 Bidding and Scheduling of PDRs in the Real-Time Market**

Pursuant to Section 4.13.3, Scheduling Coordinators for Proxy Demand Resources may submit Economic

Bids for Energy and Ancillary Services in the Real-Time Markets. Pursuant to Section 30.5.1(s),

Scheduling Coordinators for Proxy Demand Resources may submit Economic Hourly Block Bids to be

considered in the HASP, and to be accepted as binding Schedules with the same MWh award for each of

the four FMM intervals. A cleared Economic Hourly Block Bid is not eligible for Bid Cost Recovery.

Scheduling Coordinators for Proxy Demand Resources may not submit Economic Hourly Block Bids with an Intra-Hour Option.

### **30.6.2 Bidding and Scheduling of RDRRs**

Unless otherwise specified in the CAISO Tariff and applicable Business Practice Manuals, and subject to

Section 30.6.3, the CAISO will treat Bids for Energy on behalf of Reliability Demand Response Resources

like Bids for Energy on behalf of other types of supply resources. The CAISO will only accept Economic

Bids for Energy from Reliability Demand Response Resources. A Scheduling Coordinator for a Demand

Response Provider representing a Reliability Demand Response Resource may submit Economic Energy

Bids for the Reliability Demand Response Resource only in the Day-Ahead Market and in the Real-Time

Market, but may not submit Energy Self-Schedules for the Reliability Demand Response Resource, may

not Self-Provide Ancillary Services from the Reliability Demand Response Resource, and may not submit

RUC Availability Bids or Ancillary Service Bids for the Reliability Demand Response Resource. The Demand Response Provider's Demand Response Services for Reliability Demand Response Resources will be bid separately and independently from the LSE's underlying Demand Bid.

\* \* \* \* \*

### **30.6.3 Net Benefits Test for PDRs or RDRRs**

In accordance with Section 11.5.2.4, the CAISO will apply a net benefits test to determine a threshold Market Clearing Price for Proxy Demand Resources ~~and~~ Reliability Demand Response Resources ~~settlement adjustments.~~ The CAISO will not accept Proxy Demand Resource or Reliability Demand Response Resource Bids for Energy below this threshold Market Clearing Price in the CAISO Markets.

\* \* \* \* \*

### **34.4 Fifteen Minute Market**

The CAISO conducts the Fifteen Minute Market using the second interval of each RTUC run horizon as follows: (1) at approximately 7.5 minutes prior to the first Trading Hour, for T-45 minutes to T+60 minutes where the binding interval is T-30 to T-15; (2) at approximately 7.5 minutes into the current hour for T-30 minutes to T+60 minutes where the binding interval is T-15 to T; (3) at approximately 22.5 minutes into the current hour for T-15 minutes to T+60 minutes for the binding interval T to T+15; and (4) at approximately 37.5 minutes into the current hour for T to T+60 minutes for the binding interval T+15 to T+30, where T is the beginning of the next Trading Hour. In these intervals the CAISO conducts the FMM to (1) determine financially binding FMM Schedules and corresponding LMPs for all Pricing Nodes, including all Scheduling Points; (2) determine financially and operationally binding Ancillary Services Awards and corresponding ASMPs, procure required additional Ancillary Services and calculate ASMP used for settling procured Ancillary Service capacity for the next fifteen-minute Real-Time Ancillary Service interval for all Pricing Nodes, including Scheduling Points; (3) determine LAP LMPs that are the basis for settling Demand; and (4) determine FMM Uncertainty Awards. In any FMM interval that falls

within a time period in which a Multi-Stage Generating Resource is transitioning from one MSG Configuration to another MSG Configuration, the CAISO: (1) will not award any incremental Ancillary Services; (2) will disqualify any Day-Ahead Ancillary Services Awards; (3) will disqualify Day-Ahead qualified Submissions to Self-Provide Ancillary Services Award, and (4) will disqualify Submissions to Self-Provide Ancillary Services in RTM. Each particular FMM market optimization produces binding settlement prices for Energy, Flexible Ramping Product, and Ancillary Services for the first FMM interval in the FMM horizon but the optimization considers the advisory results from subsequent market intervals within the FMM horizon. The CAISO settles [Hourly Block Schedules from Proxy Demand Resources](#), Hourly Intertie Schedules, and Hourly Ancillary Services Awards accepted in the HASP as FMM Schedules and FMM Ancillary Services Awards in accordance with Section 11.5 and 11.10.1.2, respectively. In the event that a FMM run fails, the CAISO reverts to Day-Ahead Market Ancillary Services Awards and RUC Schedules results corresponding to the same interval, or the corresponding interval from the previous RTUC. The FMM will clear Supply against the CAISO Forecast Of CAISO Demand and exports. The FMM issues Energy Schedules and Ancillary Services Awards by twenty-two and a half minutes prior to the binding fifteen-minute interval.

\* \* \* \* \*

## **Appendix A**

### **Master Definitions Supplement**

\* \* \* \* \*

#### **- FMM Schedule**

The binding output of the FMM resulting from Bids submitted to the RTM. The portion of an [Hourly Block Schedule or](#) HASP Block Intertie Schedule for either Energy or Ancillary Services that becomes financially binding shall constitute a FMM Schedule.

\* \* \* \* \*

**- Hourly Block**

A Bid or Schedule in the Real-Time Market from eligible resources for the same MWh quantity over an entire Trading Hour. Binding Hourly Block Schedules result in contiguous FMM Schedules.

\* \* \* \* \*

**Attachment C – Draft Final Proposal**

**Energy Storage and Distributed Energy Resources Phase 3 Tariff Amendment**

**California Independent System Operator Corporation**



California ISO

# **Energy Storage and Distributed Energy Resources Phase 3**

**Draft Final Proposal**

**July 11, 2018**

**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 for energy storage and distribution-connected resources<sup>1</sup> to participate in the CAISO markets. The growing number and diversity of these resources are beginning to represent an increasingly important part of the future grid.

The ESDER initiative is an omnibus initiative with annual phases covering several related but distinct topics. The second phase of ESDER developed enhancements to demand response (DR), non-generator resources (NGR), multiple-use applications (MUA), and station power for storage resources.

The CAISO published a revised straw proposal on April 30, 2018 identifying the scope for ESDER 3 along with proposed policy. Subsequent to the release of the revised straw proposal, the CAISO has held both a working group meeting and conference call to further develop proposal details with stakeholders. This draft final proposal will be submitted for approval to the CAISO Board of Governors in September. Upon receipt of approval, a tariff filing with FERC will be made.

The following describes the scope of the ESDER 3:

- Demand Response – Four enhancements to current demand response participation models are proposed: (1) new bidding and real-time dispatch options, (2) removal of the single load serving entity (LSE) aggregation requirement along with need for the settlement application of a default load adjustment (DLA), (3) development of an energy storage load shift product, and (4) recognition of sub-metered electric vehicle supply equipment (EVSE) load curtailment separate contribution to resource performance.
- Multiple-Use Application (MUA) – CAISO has yet to identify specific tariff and market design changes that can be proposed within ESDER3 based on current developments in the CPUC working group. While not proposing any changes at this time, the CAISO will continue actively participating in the working group and reevaluate once the final report is submitted to the CPUC commission.
- Non-Generator Resource (NGR) – The CAISO is not proposing any changes to the current NGR participation model.

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<sup>1</sup> 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 Stakeholder Process

The CAISO is at the draft final proposal stage in the ESDER 3 stakeholder process. Figure 1 below shows the status of the draft final proposal within the overall ESDER 3 stakeholder process.

The purpose of the draft final proposal is to present the final scope and solutions of issues related to the integration, modeling, and participation of energy storage and DERs in the CAISO market. The CAISO has reviewed stakeholder feedback through comments and working group meetings in developing the final proposal to be presented to the CAISO Board of Governors, Energy Imbalance Market Governing Body, and final tariff approval from FERC.

**Figure 1: Stakeholder Process for ESDER 3 Stakeholder Initiative**



## 3 Energy Imbalance Market Classification

CAISO staff believes that ESDER 3 involves the Energy Imbalance Market (EIM) Governing Body's advisory role to the Board of Governors (Governing Body – E2 classification). This initiative proposes four changes to the proxy demand resource (PDR) and reliability demand response resource (RDRR) model with the aim of reducing barriers to participation and enhancing their ability to provide services in the day-ahead and real-time markets. While proposed enhancements to the CAISO's demand response participation models will be applicable to demand response participation models utilized by EIM participants, there are no changes specific to EIM balancing authority areas. The demand response enhancements are:

1. PDRs ~~and RDRRs~~ ability to bid as an hourly or 15-minute dispatchable resource to provide real-time dispatch enhancements;
2. Adding a component to allow a PDR to increase consumption by charging behind the meter energy storage (battery);
3. A new performance measurement recognizing Electric Vehicle Supply Equipment as an independent load curtailment contributor participating under the PDR model;
4. Eliminate the requirement for PDR and RDRR resources to be composed of service accounts under one LSE while maintaining the single sub-Lap requirements.

All of the new proposed features would apply generally throughout the ISO market, and thus be advisory for the EIM Governing Body.

## 4 Response to Stakeholder Comments

The following section provides responses to stakeholder comments since the posting of the revised straw proposal on April 30, 2018.

### **Section 5.1 – Demand response modeling limitations**

The CAISO corrected a description of the hourly bid option in which the resource will be a “price taker” for the full hour and will not receive a guaranteed price in the first 15-minute interval as previously stated. In addition, the proposal updated the new name for the Imbalance Reserve Product in the Day-Ahead Markets Enhancement (DAME) initiative, to the day ahead flexible ramping product (FRP). Lastly, the CAISO is proposing that PDRs with an hourly block bid have the option to be cleared in the day-ahead market but not be considered in RUC.

A majority of stakeholders support the bidding options proposal. CLECA requested clarification on the market award for the hourly bidding option. The CAISO has corrected the proposal to state that a resource will be a “price taker” over the full hour it is scheduled at the 15-minute market price. CLECA also requested the CAISO consider an option to guarantee the first 15-min interval price under the hourly bid option. This option is not feasible since the Hour Ahead Scheduling Process (HASP) runs approximately 45 minutes before the hour and the dispatch is based on advisory prices. Specifically, the resource’s hourly block is scheduled before the first 15-min interval price is set and 22.5 minutes before the first binding interval, therefore, all four pricing intervals of the hour are advisory. Additionally, CLECA submitted comments on the

need for minimum run time changes to the demand response model. The CAISO believes that the proposed bidding options allows for DR resources to receive the advanced notification needed for real time response and enables resources to be dispatched hourly, if needed.

### **Section 5.2 – Removal of the single LSE requirement and default load adjustment**

No major changes were proposed in the draft final proposal.

A majority of stakeholders support the proposal. SCE requested clarification on SIBR treatment of bids at the NBT threshold price. The CAISO has made the clarification in the proposal that SIBR will only accept bids at or above the NBT threshold price.

### **Section 5.3 – Load Shift Product**

The CAISO provided further details on the design of the proxy demand resource - load shift resource (PDR-LSR). The PDR-LSR is a demand response resource providing both load curtailment and dispatchable consumption to provide “energy shift.” To participate, a resource will register two separate resource IDs containing the same service accounts (Resource ID – curtailment, Resource ID- consumption). The CAISO has included an example (see attachment) for the scenario in which a facility and sub-metered energy storage participates as a PDR-LSR. The CAISO has also clarified in its description of the performance evaluation calculation, the need for 15-minute granularity in determining event/non-event intervals.

A majority of stakeholders have either expressed support or have not expressed a position on the proposal. SCE requested further information on the CAISO’s shift from moving to event day to event hours when calculating the baseline for PDRs. The CAISO clarifies that the use of event hours rather than event days was established with the metered generation output (MGO) methodology in ESDER 1 and only applies to development of a baseline to determine the typical use of a sub-metered energy storage device. PDR/RDRRs utilizing the current day matching customer load baseline (CLB) performance methodology will continue to use event days and not event hours. The CAISO moved towards a more granular approach in event intervals to capture the typical use of the energy storage device. The CAISO does not believe an event that occurred at an earlier interval justifies the removal of an entire day. The assessment of 15-minute intervals will only apply to PDR-LSRs. Event hours will continue to remain for PDR/RDRRs utilizing the MGO methodology, and event days for PDR/RDRRs using all other CAISO approved baseline methodologies. Olivine requested the use for “event days” and questioned the rationale behind the separate calculation between a facility’s load curtailment and the development of typical use for a sub-metered storage resource. The CAISO’s rationale for separating the baseline calculation between the

facility load and sub-metered storage resource is because it keeps the treatment consistent with the FERC approved MGO baseline.<sup>2</sup> In response to SCE's comment on the registration of the PDR-LSR, the CAISO clarified in its proposal that the same service accounts must be used for participation in both curtailment and consumption. SCE has also requested clarification on the consideration of retail charging for the energy storage device in the baseline. The PDR-LSR will consider both non-event charge and discharge values for a given interval, which takes into account retail charging in the calculation of the typical use value. In response to Olivine's clarifying question, PDR-LSRs can buy back day-ahead consumption awards in real-time.

The CAISO Department of Market Monitoring (DMM) detailed potential conflicting dispatch scenarios.<sup>3</sup>

1. *"Scenario 1: The curtailment resource has a minimum run time of 1 hour and is scheduled through HE21. The curtailment resource is economic in the first two intervals of HE 21 (intervals 00 and 15) and scheduled at 5MW, but is ramped down starting in the third interval of HE 21 (interval 30). The curtailment resource is uneconomic in interval 30, but its ramp rate only enables it to ramp to 1MW by interval 30. Meanwhile, the consumption resource is economically dispatched to consume starting interval 30."*

The CAISO will enforce ramp rates for a PDR-LSR to be fully dispatchable between Pmin and Pmax in either 15 or 5 minutes, depending on its elected bidding option. Enforcing the ramp rate will ensure that each resource (consumption/curtailment) will meet its dispatch in a given interval. In the scenario above, the curtailment resource would need to meet its dispatch by the end of the third interval and the consumption resource would follow the dispatch to increase load.

2. *"Scenario 2: The curtailment resource has a start-up time of 1 hour and receives dispatches starting HE18 for 5MW. The consumption resource is economic during curtailment resource's start-up time. The consumption resource could receive consumption dispatches during HE17 when curtailment resource's start-*

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<sup>2</sup> See ESDER Phase 1 Revised Draft Final Proposal  
(<http://www.caiso.com/Documents/RevisedDraftFinalProposal-EnergyStorageDistributedEnergyResources.pdf>)

<sup>3</sup> For further details please refer to DMM's comments  
(<http://www.caiso.com/Documents/DMMComments-EnergyStorage-DistributedEnergyResourcesPhase3-Jun252018.pdf>)

*up time is honored. The curtailment resource requires advanced notice to curtail/generate as specified by its start-up time, but the consumption resource may be dispatched to increase load leading up to the curtailment.”*

The PDR-LSR’s design will utilize existing market functionalities. The consumption resource, will be designed in similar fashion to the existing NGR model, which will not have certain parameters such as startup time. In contrast, the curtailment resource ID will reflect the same parameters as PDRs have today.

3. *“Scenario 3: Even if the curtailment resource has a 0 MW Pmin and both IDs have infinite ramp, the curtailment resource and consumption resource can receive two different dispatch instructions in the same interval. Suppose the curtailment resource is scheduled through HE21 and its minimum run time of 1 hour is honored. However, the curtailment resource is no longer economic starting HE21 interval 30 and is dispatched down, sitting at 0MW through the balance of hour. Meanwhile, the consumption resource is economically dispatched to consume through the balance of HE21.*

*Starting HE22, the system needs additional supply. The market schedules the curtailment resource to ramp up (curtail/supply) and the consumption resource to reduce consumption.*

*Starting HE22, the curtailment resource is asked to curtail (supply) 5MW and the consumption resource is asked to curtail (reduce consumption) 5MW. The market schedules 10 MWs of movement on the single resource between HE21 Int45 and HE22 Int00, not just 5MW of supply on curtailment resource.”*

The CAISO understands the scenario in which both resource IDs will be expected to respond to a dispatch. The CAISO does not have any operational concerns with the dispatch scenario above because it was a valid decision made by the market optimization system. The CAISO will monitor for this scenario with the implementation of the PDR-LSR.

#### **Section 5.4 – Measurement of EVSE performance**

No major changes were proposed in the draft final proposal

A majority of stakeholders supported the EVSE proposal. SCE stated that it “retains its concern on EVSE sub-metering regarding the lack of a dedicated meter for the resource.” The CAISO has understood SCE’s concerns as well as the positions of other stakeholders and have made the decision to move forward with the proposal. But, it will continue to monitor the potential use-cases SCE had presented.

## 5 Demand Response Resources

The CAISO is proposing the following enhancements to the Proxy Demand Resource (PDR) and Reliability Demand Response Resource (RDRR) participation models.

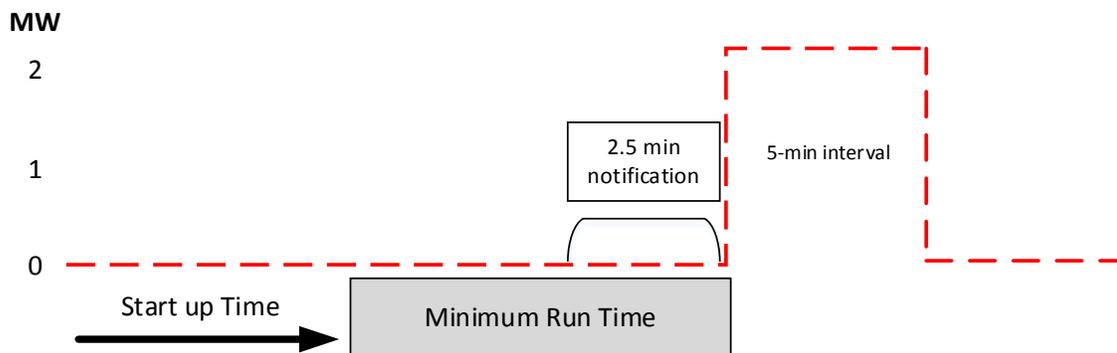
### 5.1 Demand response modeling limitations

DR resources are successfully integrated into the CAISO market and aide in meeting system reliability. The CAISO is looking to continue market design enhancements to provide DR resources options to inform the CAISO of its operating characteristics to align the market optimization of these resources in the day-ahead and real-time market processes.

#### Minimum and Maximum Run-Time Constraints

The CAISO understands the conflict due to a DR resource’s Pmin of 0 MW and the CAISO market optimization. Today, the CAISO market systems will issue a start-up instruction to a DR resource to their Pmin, often 0 MW, well in advance of the commitment hour in the real-time market. This commitment ensures both start-up and minimum runtime constraints are met, however, since the resource is considered “running” at a Pmin of 0 MW, it is available for dispatch whenever the resource’s energy bid is economic. This can result in 5-minute dispatch instructions that have only a 2.5-minute notification time. Certain affected stakeholders have explained that this notification time is infeasible for many PDRs. Figure 2 below represents this scenario.

Figure 2: Commitment of DR resource with a Pmin of 0 MW



The CAISO respects the resource’s minimum run-time constraint when committing at Pmin, represented in Figure 2 as the gray horizontal bar. However, the minimum run-

time constraint at times may be met while the resource is at a Pmin of 0 MW, which is dispatched above its Pmin, represented as the dashed red line above.<sup>4</sup> Stakeholders have suggested that the PDR participation model does not effectively recognize two constraints:

- (1) Recognition of the minimum run time when the resource is dispatched above its Pmin of 0 MW;
- (2) Limitation in using the maximum daily energy limit instead of a maximum run time to recognize daily use limitations.

### 5.1.1 Proposal

#### Hourly and 15 minute bidding option for PDRs

The CAISO is proposing to offer bidding options for PDRs/~~RDRRs~~ that will provide longer notification times and extended real-time dispatch intervals, similar to what the CAISO currently offers to intertie resources. The CAISO introduced this option and its application to PDRs/~~RDRRs~~ in a joint workshop with the CPUC on October 4, 2017.<sup>5</sup> Additionally, PDRs that elect the hourly bid option will also be eligible to be cleared in the day-ahead market but not be considered in RUC.<sup>6</sup>

The CAISO believes applying an hourly economic bidding and real-time dispatch model to PDRs/~~RDRRs~~, which require longer notification time or cannot respond to 5-minute dispatches, provides them with an additional alternatives to viably participate in the real-time market. The CAISO's goal is to leverage existing market functionality, where possible, to enable demand response resources to participate more effectively and efficiently in the market.

#### Pre-Market

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<sup>4</sup> Definition of minimum run time

[http://www.caiso.com/Documents/Section34\\_RealTimeMarket\\_asof\\_May2\\_2017.pdf](http://www.caiso.com/Documents/Section34_RealTimeMarket_asof_May2_2017.pdf)

<sup>5</sup> Link to presentation from CAISO-CPUC joint workshop introducing CAISO's 15-minute market and bidding options for real-time imports and exports, slides 51- 59.

[http://www.caiso.com/Documents/Presentation\\_JointISO\\_CPUCWorkshopSlowResponseLocalCapacityResourceAssessment\\_Oct42017.pdf](http://www.caiso.com/Documents/Presentation_JointISO_CPUCWorkshopSlowResponseLocalCapacityResourceAssessment_Oct42017.pdf)

<sup>6</sup> With the future implementation of the DAME initiative, RUC will be co-optimized with the IFM. The CAISO will award resources that are willing to be dispatched in FMM and/or RTD DA flexible ramping product. PDR resources that cannot be dispatched in FMM and/or RTD can register this limitation, which will prevent the resource from receiving a DA FRP award.

The PDR/~~RDRR~~ will register in Master File if the resource can be scheduled as an hourly block, scheduled in 15-minute intervals, or 5-minute dispatchable. Until implementation of the DAME, if a PDR elects the hourly block bid option, it can also register in Master File the option to not be considered for a RUC. Once the DAME are implemented, the IFM and RUC will be co-optimized in a single market optimization and hourly block resources will be ineligible for DA FRP awards. This option will only apply to PDRs with an hourly block bid, because the resource can only be scheduled in the real-time market during the hour ahead scheduling process (HASP).<sup>7</sup> The HASP determines the hourly energy schedule by enforcing a constraint that the resources schedule for each advisory 15-minute interval is equal. Since the resource's schedule cannot be determine for each 15-minute interval, the HASP schedule is a price taker in the fifteen minute market (FMM). The process to change Master File characteristics will remain the same under the existing BPM in which changes can take anywhere from 5 to 11 business days.<sup>8</sup> Once the PDR/~~RDRR~~ has registered the scheduling option, it will be required to submit bids accordingly.<sup>9</sup> ~~Specific to RDRR, awards from the day-ahead market will be dispatched according to their day-ahead awards and any remaining capacity bid into the real-time market would be held back for emergency response purposes. However, when an RDRR's capacity is "released" into the market after an emergency is called, the RDRR will be dispatched according to its bid parameters.~~

### **Market**

Once the resource elects its scheduling option in Master File, the PDR/~~RDRR~~ resource will follow one of the processes below:

1. **Hourly block** –the SC submits a day-ahead market bid for an entire hour. In the real-time market, the resource will be scheduled via the HASP but will be settled at 15-minute market prices over the operating hour. The binding schedule is communicated to the SC at 52.5 minutes before the flow of energy. Because the resource is scheduled for the full hour, it will settle at the FMM in real time making it a “price-taker” for the full hour. In the example below, the resource is

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<sup>7</sup> PDRs electing the hourly block bid option without a RUC obligation can only be considered as a system RA resource.

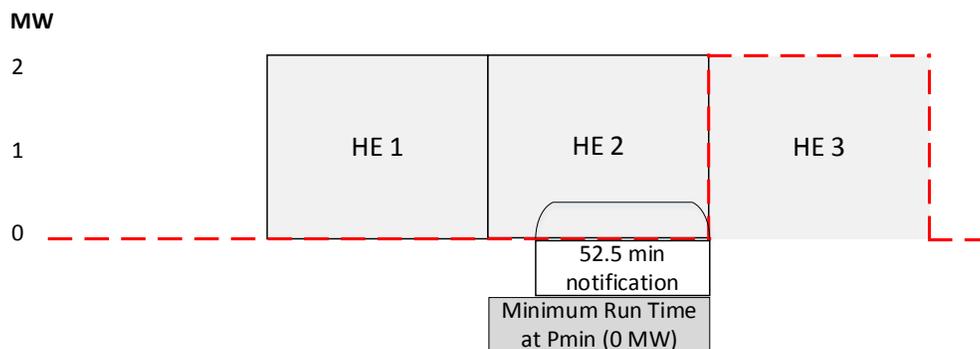
<sup>8</sup> CAISO BPM for Market Instruments, “Master File Update Procedures” Attachment B (<https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Market%20Instruments>)

<sup>9</sup> ~~Applicable to RDRRs that elect to economically bid in day-ahead market. All other real-time reliability bidding requirements will remain for RDRRs recognizing their reliability only bidding in the real-time market.~~

a 2 MW resource that opted to bid hourly. The CAISO respected the minimum run time parameter (1 hour) in HE 2 and 3. In HE 2, the CAISO sent a dispatch notification 52.5 minutes before the flow of energy for HE 3.

Following the market design principle laid out in CAISO's FERC 764 tariff compliance, the CAISO will not allow for bid cost recovery (BCR) for PDRs that elect an hourly bid option.<sup>10</sup>

**Figure 3: Example of hourly bid option**



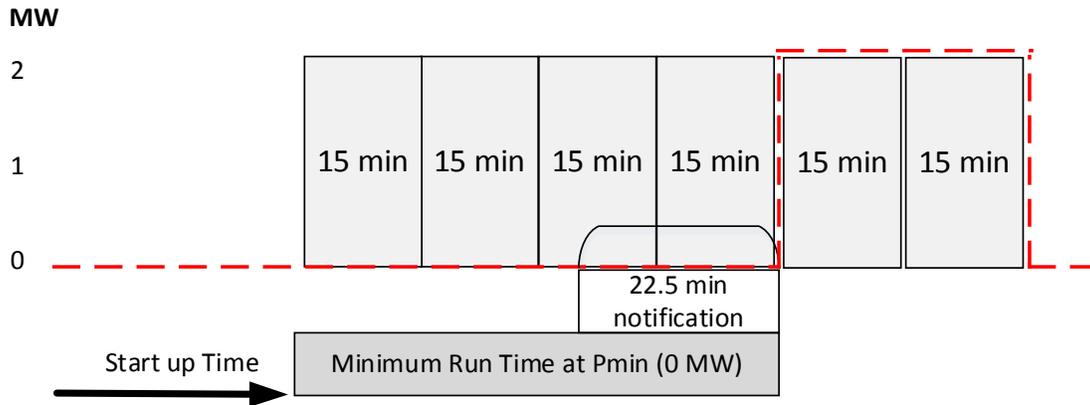
2. **15-minute dispatchable** – The SC will submit supply bids in hourly increments in the day-ahead market. In the real-time market, hourly energy bids are submitted no later than 75 minutes prior to the operating hour. If the 15-minute bid is economic, it will be dispatched and receive a binding schedule at the FMM price. The dispatch notification is communicated 22.5 minutes before the flow of energy is expected.

PDRs electing the 15-minute bid option will be eligible for BCR. Bid cost recovery allows a resource committed by the CAISO to recover its startup costs, minimum load costs, ancillary service bids, and energy bids over the course of the day (the 24 hours of that day). In the case that the FMM price does not cover the dispatched resource's bid-in costs, the CAISO will ensure that the resource is compensated for providing energy.

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<sup>10</sup> CAISO's tariff compliance filing on FERC Order 764 (see pg. 30-32) ([http://www.caiso.com/Documents/Nov26\\_2013\\_TariffAmendment-Real-TimeMarketDesignEnhancementsRelated-Order764\\_ER14-480.pdf](http://www.caiso.com/Documents/Nov26_2013_TariffAmendment-Real-TimeMarketDesignEnhancementsRelated-Order764_ER14-480.pdf))

Figure 4: Example of 15-minute bid option



**Post-Market**

Currently, PDRs are settled on the 5-minute real time Locational Marginal Price (LMP). If a PDR elects an hourly or 15-minute bid option, the CAISO will settle the resource under the FMM LMP. The CAISO established the process for FMM settlement under its FERC Order No. 764 proposal.<sup>11</sup> The day-ahead energy schedule will be settled at the day-ahead LMP. Any imbalances between the FMM energy schedule and the day-ahead energy schedule is settled at the FMM LMP.

**5.2 Removal of the single LSE requirement and default load adjustment**

The CAISO currently requires DR resource aggregations consist of locations under a single LSE, represented by one demand response provider (DRP), and within a single sub-LAP. The CAISO originally established the single LSE requirement in its PDR policy, later replicated in the RDRR policy, to facilitate the settlement application of a LSE specific DLA.<sup>12</sup> This adjustment eliminated the double payment for a decrease in demand when it was not net beneficial to all purchasers in terms of a wholesale market

<sup>11</sup> CAISO Draft Final Proposal on FERC Order 764 (see pg. 18-19).  
<http://www.caiso.com/Documents/DraftFinalProposal-FERC-Order764MarketChanges.pdf>

<sup>12</sup> The DLA represents the amount of load curtailed, based on a PDR or RDRR demand response energy measurement, within a Default LAP specific to the LSE when the real-time LMP is below the threshold price.

price reduction based on a demand response net benefits test.<sup>13</sup> This design feature required segmenting a DR program into different aggregations by LSE within a single sub-LAP. DR market participants claimed this segmentation could potentially strand willing customer participants and affect the ability for some PDRs to meet the minimum wholesale market participation size requirement. In more specific cases, DRPs establishing new resource aggregations, or are in the process of developing new ones, have expressed difficulty meeting, or maintaining, the 100 kW minimum participation requirement as customers within their resource aggregations are defaulted or move to new LSEs, such as to a Community Choice Aggregation (CCA).

The DLA settlement mechanism requires PDR and RDRR aggregations to be under a single LSE. The DLA originated from FERC Order 745, which required the CAISO to implement a net benefits test (NBT).<sup>14</sup> The NBT establishes a price threshold at which demand response resources are deemed cost effective. If the real-time market LMP is below the threshold, the DLA is triggered; resulting in the adjustment of the metered load used in the uninstructed imbalance energy (UIE) settlement of the LSE's default load aggregation point (DLAP). This mechanism is utilized to mitigate double payment for demand response services provided in intervals where the threshold price is not met but payment to the PDR or RDRR is made.

### 5.2.1 Proposal

The CAISO proposes to remove the single LSE requirement for DR aggregations and application of the DLA. The CAISO believes by removing the single LSE requirement, the application of the DLA becomes too complex to implement and manage across multiple LSEs under a single PDR. Additionally, the settlement implications of the DLA have historically been *de minimis* relative to the benefits achieved by eliminating the one LSE per PDR requirement (see Figure 5 and Figure 6 below).

As requested by stakeholders, the CAISO conducted an analysis of the total DLA affected MWs, their settlement impacts, and how frequently the DLA was applied in 2017. On average, the DLA calculation was triggered 4% of the month over the course of a year.<sup>15</sup> The monthly total of demand response resource MWs identified as being provided below the NBT threshold price and settlement charges resulting from the application of

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<sup>13</sup> CAISO Net Benefits Test

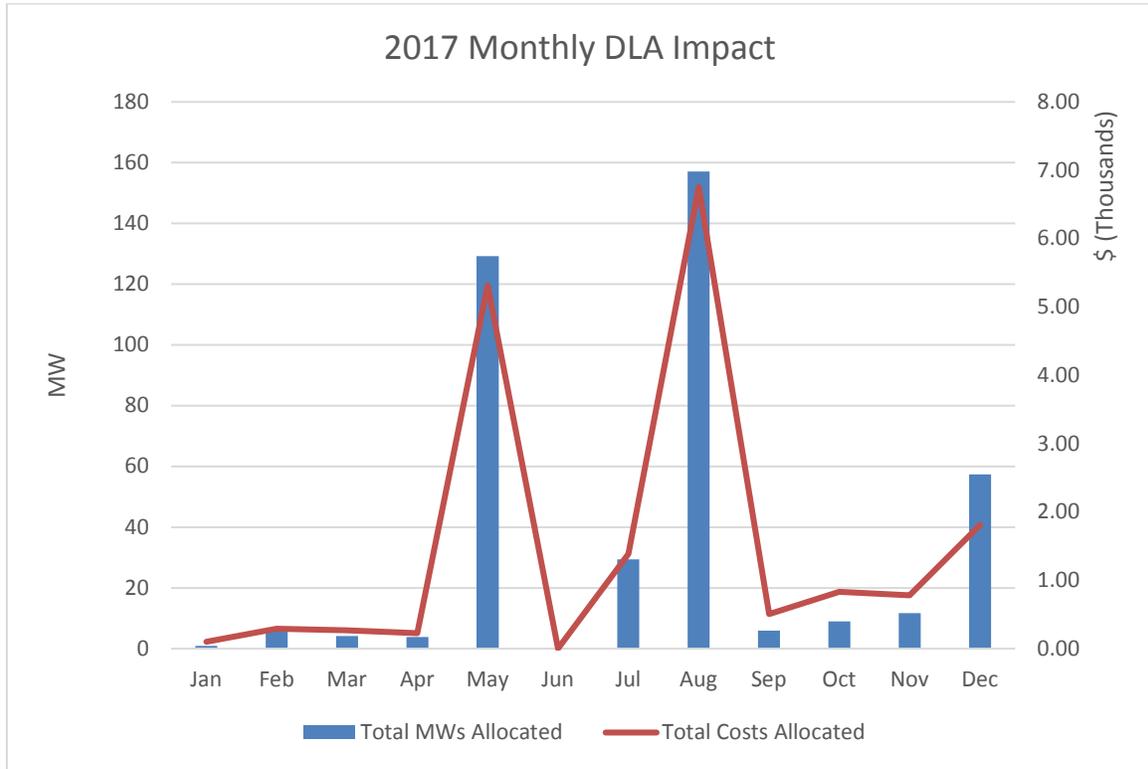
[http://www.caiso.com/Documents/IssuePaper\\_DemandResponseNetBenefitsTest.pdf](http://www.caiso.com/Documents/IssuePaper_DemandResponseNetBenefitsTest.pdf)

<sup>14</sup> FERC Order 745 <https://www.ferc.gov/EventCalendar/Files/20110315105757-RM10-17-000.pdf>

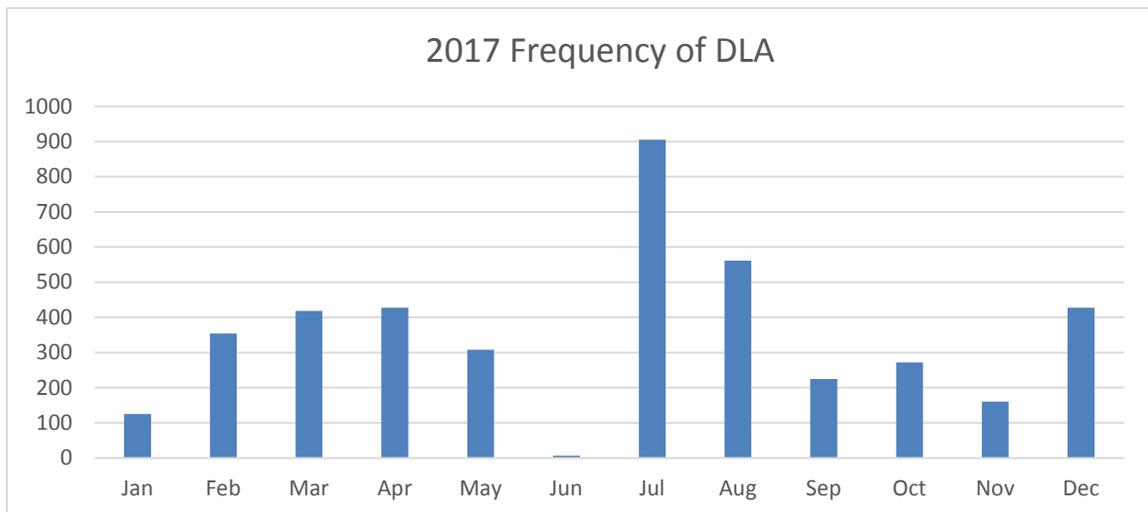
<sup>15</sup> Based on the number of intervals DLA was triggered/ total number intervals in a month.

the DLAs to the LSEs, are shown below in Figure 5 and Figure 6. The CAISO's DLA settlement impact analysis, in part, supports removal of the calculation and that its removal results in a *de minimis* settlement impact. The CAISO maintains that removal of the DLA is necessary to institute an aggregation requirement, highly desirable by stakeholder, allowing multiple LSEs to be represented within a single PDR/RDRR.

**Figure 5: 2017 Total Monthly DLA Impact**



**Figure 6: Number of intervals a DLA was triggered per month**



**Pre-market**

Currently, the demand response registration process (DRRS) requires a registration for a PDR or RDRR to be composed of locations with the same LSE service accounts. The CAISO proposes to remove the single LSE aggregation rule and make appropriate changes to the DRRS as well as remove enforcement of the single LSE registration requirement.

**Market**

The CAISO proposes to utilize the NBT threshold price to screen submitted PDR bids in the CAISO's Software Infrastructure Business Rules (SIBR) in compliance with FERC Order No. 745. SIBR will accept bids only at or above the established net benefits threshold price. This SIBR rule bidding requirement will ensure PDR and RDRR resources are net beneficial to the system when submitting bids to the CAISO rather than an after-the-fact assessment in the settlement system. The CAISO will use the existing monthly calculation of the NBT and its resulting on-peak and off-peak threshold prices in SIBR to validate bid submissions in the day-ahead and real-time markets to ensure all energy prices in the energy bid are at or above the threshold price. If this condition is not met, SIBR will invalidate the bid and a status will be displayed on the SIBR user interface. The SC will have an opportunity to correct and re-submit valid bids until the market closes. An invalid bid cannot overwrite a bid previously submitted within that market. SIBR will continue validating submission of RDRR bids in the real time market against the current rule requiring their bid prices in the energy bid curve to be at or above 95% of the energy bid price ceiling.

**Post-market**

Today, the DLA application is triggered within an LSE for the intervals in which the real time LMP falls below the NBT threshold price and PDR/RDRR delivers energy. Because the CAISO will accept demand response resource bids only at or above the NBT price threshold, the CAISO will remove the DLA application.

## 5.3 Load Shift Product

In approving the ESDER 2 proposal, the CAISO Board of Governors requested staff continue working with stakeholders on proposals set out by the original load consumption working group for enhancing the PDR model to provide additional services during oversupply conditions.

### 5.3.1 Proposal

The CAISO is proposing to develop a load shift product for behind the meter (BTM) storage devices under the PDR participation model. The load shift product will fall under existing PDR policy provisions, but will develop certain functionalities allowing the resource to bid and be dispatched for both load consumption (charging, negative generation) and load curtailment (discharging, generation) from a BTM storage resource. The initial product will allow a PDR to access day-ahead and real-time energy markets for both load curtailment and load consumption capabilities through the use of two separate resource IDs. The proposal will facilitate the provision of “shift” services while maintaining a demand response policy principle that injection or export of BTM energy storage beyond the retail meter is not eligible for wholesale market compensation.

The CAISO is proposing the following features listed below:

- Participation requires direct metering of BTM energy storage
- Resource pays full retail rate for all charging energy
- Energy storage resource will maintain its own state of charge
- Load curtailment resource ID
  - Maintains RA capacity eligibility
  - Non-exporting rule applies
- Load consumption resource ID
  - Ineligible for RA capacity and ancillary services
  - Ability to bid a negative cost for load consumption energy services

#### **Pre-market**

The CAISO proposes that the PDR-LSR will facilitate the provision of load curtailment and load consumption by two discrete resources registered in Master File, one resource ID to reflect the operating characteristics of the resources curtailment capabilities and the second resource ID to reflect those of its consumption capabilities. Both resource IDs will be able to register using the same registered service accounts. At least one of the service accounts must have a behind the meter storage to qualify as a PDR-LSR.<sup>16</sup> A

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<sup>16</sup> The CAISO at this time, defines “behind the meter storage” as a battery storage resource that can be directly metered.

resource wanting to participate under the PDR-LSR must register with both resource IDs and cannot opt to register for just the consumption functionality. PDR-LSRs may have an RA obligation for the provision of curtailment and will still have a MOO applicable to the PDR-LSR resource ID identified as such. Due to the design of two discrete resource IDs, the resource ID representing curtailment will need to register with a Pmin of 0 MW. The CAISO believes that in addition to specific bidding rules (detailed below), enforcing ramping capabilities for each resource, and the Pmin requirement during registration, will prevent scenarios in which both resource IDs will be given conflicting dispatches.

**Market**

To ensure that conflicting dispatches will not occur within intervals, the CAISO proposes that the PDR-LSR will be available to bid either as a 15-minute or 5-minute dispatchable resource only. Because the PDR-LSR is a single product with two resource IDs, it must bid both resource IDs consistently and exclusively. For example, if a PDR-LSR elects to be dispatchable on a 5-minute basis under the resource IDs providing consumption, it cannot elect to use the hourly or 15-minute bid option for the resource ID providing load curtailment. The PDR-LSR must maintain symmetric dispatchability for both resources by selecting the same real time bidding options for both load curtailment and consumption resource IDs.

The CAISO also proposes that the load consumption resource ID for the PDR-LSR will only be allowed to bid from the bid floor (-\$150) up to a value less than \$0. Load consumption for the purposes of the load shift product will not be allowed to bid in the positive range to prevent conflicting dispatch signals. The load curtailment resource ID will only bid at or above the NBT price threshold to the bid cap (currently at \$1,000). The CAISO is proposing to prohibit the load consumption resource ID to provide ancillary services because DR resources can only provide spin/non-spin services and not regulation. Table 1 summarizes the bidding rules and services of a PDR-LSR.

**Table 1: Bidding and Energy Services**

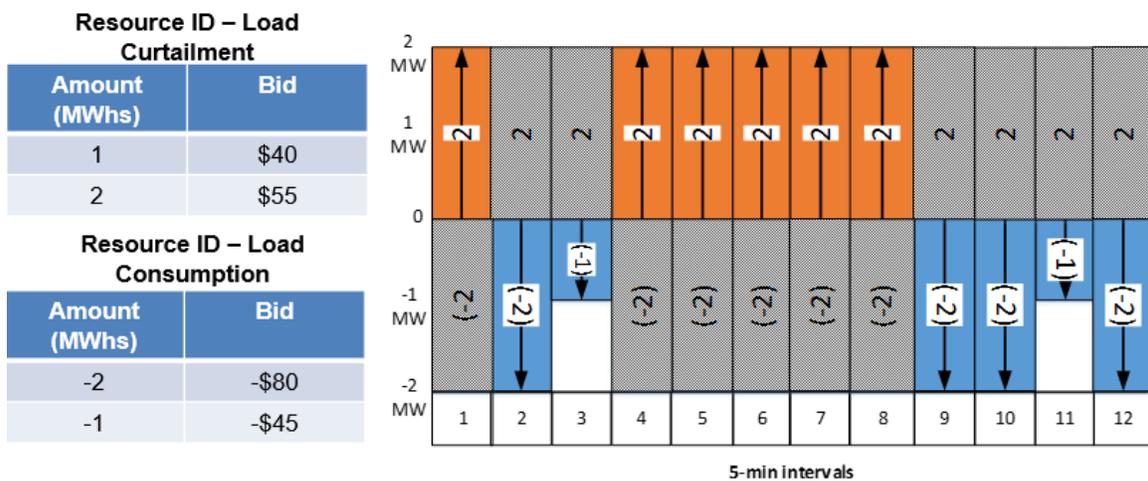
Resource ID	Bid Options <sup>17</sup>	Bid Range	Services
Curtailment	15-min/5-min	NBT Price to Bid Cap	Energy, FRP, DA FRP
Consumption		-(Bid floor) to < \$0	

<sup>17</sup> Bids must be uniform between both resource IDs

A PDR-LSR will be eligible for BCR. The CAISO will calculate BCR as it does today for the load curtailment resource ID. For load consumption, the CAISO will offer BCR because the resource’s bid has indicated a price to consume energy in a given interval, and may have foregone revenues of providing a service outside of the CAISO market. In the course of a day, if the resource was not able to recover its bid costs, the CAISO will make the resource whole. The CAISO will calculate the BCR for both resource IDs separately.<sup>18</sup>

Figure 7 illustrates how the resource would bid both resource IDs along with a potential corresponding award in 5-minute intervals.

**Figure 7 Load Shift Resource bid stack and awards in the market**



**Post-market**

The load curtailment resource ID will be settled under the same rules as it is today with slight modifications to how the Demand Response Energy Measurement (DREM) is developed. The load consumption resource ID will follow the same guiding principles under the load curtailment (current PDR settlement); except, the resource will settle as negative generation utilizing a separate performance measurement. The PDR-LSR will follow the same meter data submission requirements for all PDR/RDRRs.

**Performance Evaluation Methodology**

The SC or DRP will calculate the performance of the PDR-LSR. Each performance methodology will be referenced as either “LSR-curtailment” or “LSR-consumption.” Both methodologies will net out “typical usage” to define the incremental load

<sup>18</sup> Please refer to the CAISO’s Department of Market Monitoring’s example on potential BCR calculation in its revised straw proposal comments (<http://www.aiso.com/Documents/DMMComments-EnergyStorage-DistributedEnergyResourcesPhase3-Jun252018.pdf>)

consumption or curtailment provided. The development of a typical usage adjustment will include both consumption and curtailment behavior of the PDR-LSR resource IDs:

- Established through a look back of both of the PDR-LSR resource IDs, the typical usage will take into account the consumption and curtailment values during non-event 15-minute intervals using a 10-in-10 non-event 15-minute selection method for similar days.
- The look-back period will extend to 45 days and calculate the simple average of the energy consumed or curtailed during the 10 most recent non-event 15-minutes for the same day type and for the same event interval when the PDR-LSR dispatch event occurred.<sup>19</sup>
- Two different day-types are recognized: Weekday (Monday through Friday), Weekend/Holiday (Saturday, Sunday, or NERC holiday).
- An event interval is one in which the PDR-LSR was subject to an Outage or previously provided Demand Response Services (other than capacity awarded for AS) in a given interval.
- A simple average will be limited to represent a typical usage for consumption/curtailment used to establish the point at which the resource is providing net load consumption.

The CAISO is proposing the following to develop a PDR-LSR typical usage:

1. LSR-curtailment (To account for load curtailment of energy storage): 10-in-10 customer load baseline, using 10 non-event hours including both consumption and curtailment in the calculation of the simple average, but only accept a value that is at or above 0 (positive generation = curtailment).
2. LSR-consumption (To account for load consumption of energy storage): 10-in-10 customer load baseline, using 10 non-event hours including both consumption and curtailment in the calculation of the simple average, but only accept a value that is at or below 0 (negative generation = consumption).

The PDR-LSR typical use value will be used to adjust the metered output, generation or load, when calculating its performance attributed to a curtailment or consumption dispatch. Changing the MGO methodology for energy storage participating under the

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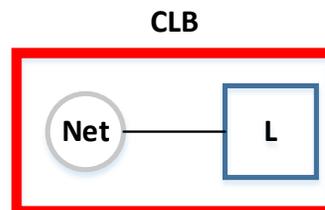
<sup>19</sup> If the target number of intervals are not reached (Weekdays = 10 intervals; 5 intervals minimum) (Weekend = 4 intervals) the higher value of either the collected intervals or minimum number of intervals will be used. If the minimum number of intervals cannot be found, the value will be set to zero.

PDR-LSR is to account for a resource that is now responding to dispatches for consumption and curtailment. The CAISO believes the “typical use” of an energy storage resource as a PDR-LSR must consider movement in both directions. A participant that opts to provide load curtailment only with a directly metered energy storage device will continue to use the current MGO calculation under PDR, which only considers curtailment values in the 10 non-event hours.

### Application of Performance Methodology

Currently, the DRP or SC calculates the performance of a facility’s load curtailment with the option through the FERC approved MGO methodology that recognizes a sub-metered storage device’s contribution to the facility’s overall load curtailment.<sup>20</sup> With the proposal of the PDR-LSR performance methodology, the DRP or SC of a PDR-LSR has the ability to calculate the load curtailment of the facility, load curtailment of the sub-metered storage device, and the load consumption from the sub-metered storage device. The following scenarios illustrate the various performance methodology configurations for a PDR with the inclusion of the proposed PDR-LSR methodologies.

1. **PDR** – A PDR resource that only offers load curtailment from the whole premise with no sub-metered devices. The PDR would calculate its performance methodology using a CAISO registered Customer Load Baseline (CLB)

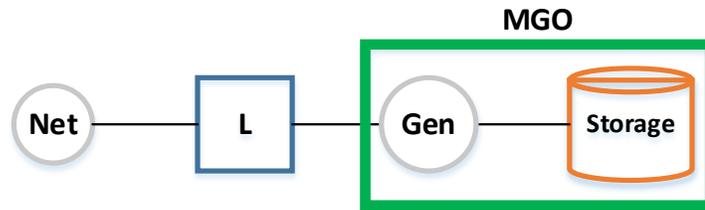


2. **PDR (sub-metered gen device ONLY)** – A PDR with a sub-metered energy storage device that only offers load curtailment. The facility load does not participate as a PDR which results in the sub-metered storage device utilizing the MGO methodology.<sup>21</sup>

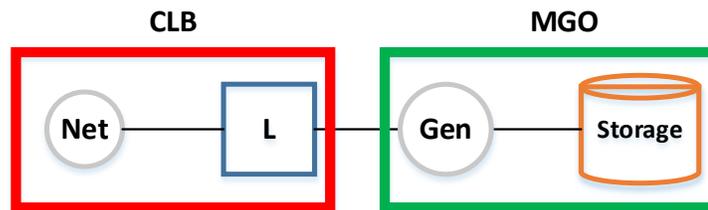
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<sup>20</sup> ESDER Phase 1 Draft Final Proposal describing MGO methodology, pg. 20-31  
<http://www.caiso.com/Documents/RevisedDraftFinalProposal-EnergyStorageDistributedEnergyResources.pdf>

<sup>21</sup> Note, the configuration does not allow for the independent participation of a sub-metered storage device if a facility does participate as a PDR.



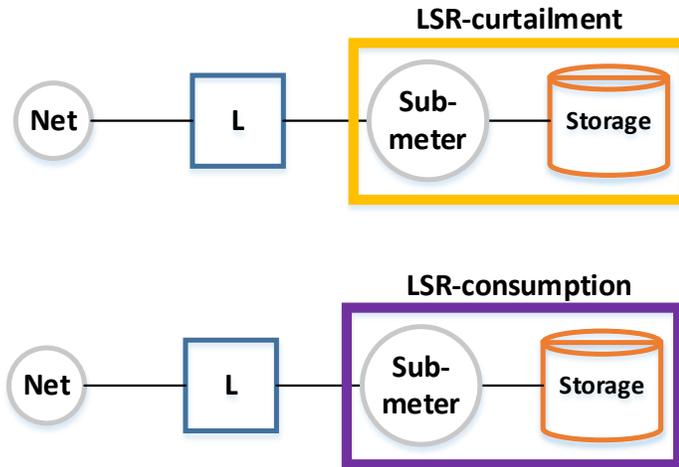
3. **PDR (sub-metered gen device)** – A PDR where the facility load and a sub-metered energy storage device offers load curtailment. Performance evaluation is separated by facility load curtailment and gen device load curtailment. The facility load nets out the sub-metered gen device and utilizes a CAISO registered CLB. The MGO methodology will then apply to the sub-metered gen device. Both values are combined to represent the total performance value of load curtailment provided.



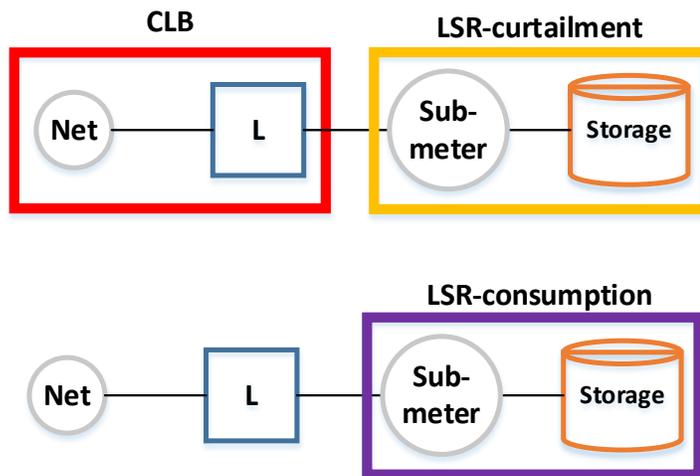
4. **PDR-LSR (sub-metered storage device only)** – A PDR-LSR where the facility load does not participate to provide load curtailment but only the sub-metered energy storage device provides load curtailment and consumption.<sup>22</sup> The sub-metered storage device will utilize the proposed PDR-LSR methodologies for load consumption and curtailment.

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<sup>22</sup> See footnote 21



5. **PDR-LSR (Facility and sub-metered storage device)** – A PDR-LSR where the facility load is offering load curtailment and the sub-metered storage device is providing both load consumption and curtailment. The facility load nets out the sub-metered storage device and utilizes a CAISO registered CLB to calculate its load curtailment value. The sub-metered storage device will utilize the LSR-curtailement calculation to combine with the facility load CLB derived value. The LSR-consumption methodology will only apply to the sub-metered storage device. The CAISO has included a numerical example as an attachment to the Draft Final Proposal.



## 5.4 Recognition of behind the meter EVSE load curtailment

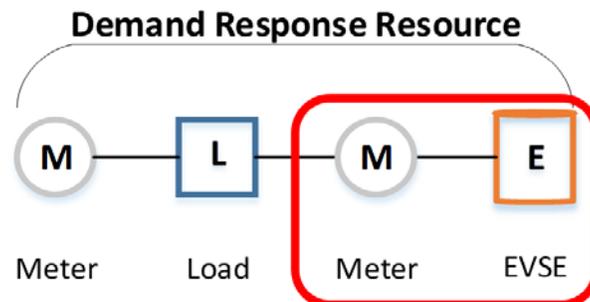
FERC approval of the CAISO ESDER 1 initiative tariff filing resulted in the implementation of the MGO performance measurement, which uniquely recognized a sub-metered

storage device's contribution to a facility's overall load curtailment during a CAISO dispatch event. As part of the ESDER 2 initiative process, comments received from certain stakeholders requested that the MGO concept extend to sub-metered EVSE loads. The design would allow for the recognition and measurement of an EVSE's load curtailment distinct from the facility's load.

### 5.4.1 Proposal

The CAISO proposes to enable EVSEs sub-metering and extend the MGO performance method for EVSE market participation independent of, or in combination with, its host customer. To be sure, EVSEs or any sub-metered device can already participate using the MGO provisions, but the CAISO currently cannot accommodate a sub-metered resource with a different performance methodology than its host facility load, which many desire for EVSEs. Sub-metering resolves the lack of fifteen-minute interval metering at the host facility for measurement of curtailment in five-minute intervals, enables direct measurement of the actual EV load curtailment achieved, and creates a more tailored market participation model for EVSEs.

**Figure 8: CAISO's proposal to capture performance measurement of EVSE**



#### Pre-market

The CAISO proposes to differentiate between an “EVSE residential” designation and an “EVSE non-residential” designation in the DRRS.

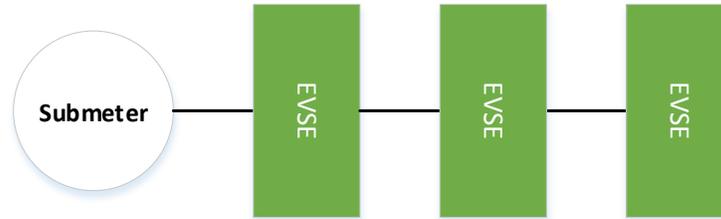
1. EVSE residential – Will use a 5-in-10 customer load baseline
2. EVSE non-residential – Will use a 10-in-10 customer load baseline

The CAISO is proposing to support flexibility on metering configurations as long as it complies with the standards defined in the CAISO BPM for Metering, attachment G.<sup>23</sup>

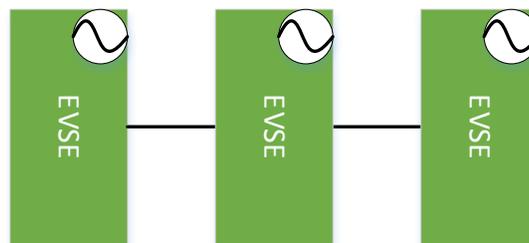
<sup>23</sup> CAISO BPM for Metering (<https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Metering>)

The CAISO has illustrated in Figure 9 and Figure 10 the potential metering constructs for EVSEs.

**Figure 9: Single sub-meter in front of aggregation of EVSEs**



**Figure 10: Individual meters embedded in EVSE**



### Market

*The CAISO does not propose any changes to market systems because the proposal is only affecting the performance measurement of an EVSE.*

### Post-market

The CAISO proposes to apply similar principles of the MGO calculation to the EVSE measurement. The “EVSE residential” will utilize the 5-in-10 CLB methodology and the “EVSE non-residential” will utilize the 10-in-10 CLB methodology. Both CLBs will have a look back period of 45 days using either 5 or 10 of the most recent non-event hours. The demand response energy measurement (DREM) derived using the CLB will be in 5-min granularity with the option that if the sub-metered EVSE generates 15-minute interval data, the SC will transpose the data to three 5-minute intervals. Neither “EVSE residential” nor “EVSE non-residential” will have a load point adjustment (LPA) due to an EVSE’s performance not being weather dependent.

## 5.5 Multiple-Use Applications

Multiple-Use Applications (MUA) are when resources provide services to and receive compensation from more than one entity (e.g., the CAISO and a UDC) or in more than one domain (customer, distribution, transmission). BTM resources, DERs, and DER aggregations (DERAs) particularly seek to engage in MUAs in order to “stack” services

and revenue streams and thereby optimize their resource's value. Depending on the points of interconnection of the resources and the specific use-case, the resource may provide services to a combination of end-use customers, the distribution system, and the wholesale market and transmission system.

Since early 2016, the CAISO has supported the MUA policy development by collaborating with CPUC staff in its Energy Storage Proceeding Track 2 (R.15-03-011). CAISO and CPUC staff collaborated to produce a report, "Joint Workshop Report and Framework – Multiple-Use Applications for Energy Storage," which the CPUC issued on May 18, 2017 as part of an ALJ ruling seeking comments. The report was discussed at a CPUC workshop on June 2, 2017, followed by two rounds of public comments submitted in July 2017. The CPUC issued a ruling on January 11, 2018 that set forth principles for MUAs. The order also established subsequent working group meetings scheduled for 2018 to develop a final report to the CPUC commission by August 9, 2018 per D.18-03-011.

Since the decision, the CAISO has been actively participating in all working group meetings. At the time of the writing of this draft final proposal, the CAISO has yet to identify and develop a proposal within ESDER 3 that is needed to facilitate the implementation of the MUA framework. The CAISO will assess the adopted MUA rules and recommendations that emerge from the report against changes to tariff and/or market design that should be facilitated as part of a future CAISO initiative.

## 5.6 Non-Generator Resources

In its revised straw proposal, the CAISO provided an overview of issues that NGRs face while participating in the wholesale market. The revised straw proposal detailed the CAISO's understanding of stakeholders' issues and presented the CAISO's position on those issues. The CAISO will not be submitting any formal proposals to enhance the NGR participation model.

The CAISO understands the stakeholders and the various scenarios that battery storage resources be accommodated in the market. However, the CAISO is tasked with the difficult job of balancing system needs with the integration of fast ramping capabilities of battery storage. The CAISO agrees with stakeholders that an artificial "slower" ramp rate is not the right approach because it does not accurately represent the resource's capabilities. The CAISO agrees with PG&E that, "throughput cannot be perfectly

managed on a daily granularity, but can be managed over time.”<sup>24</sup> To go further, the CAISO believes that throughput limits can be expressed by scheduling coordinators through bidding parameters, as PG&E demonstrated with its battery storage resources.

The CAISO also has heard from stakeholders that battery storage resources should qualify as a use-limited resource to help manage excessive cycling. The CAISO understands that a manufacturing warranty may limit the number of battery storage cycles, but the CAISO has not been provided specific contract provisions that battery storage resources must adhere to and how those provisions may compare to current, actual use-limitations. The CAISO desires to explore this issue further with the storage community and is open to developing the process and qualifications for NGRs to qualify as a use-limited resource under the CAISO’s Commitment Cost Enhancements 3 (CCE3). Throughout the initiative, the CAISO requested that impacted stakeholders submit comments that provide potential use-limited qualifying factors and the types of documents a resource owner should provide to the CAISO to justify receiving use-limited status, but did not receive any comments.

To address the second issue on infeasible AGC signals as well as the regulation performance accuracy measurement being set too low, the CAISO staff is working with individual stakeholders to understand and resolve these issues. If a problem with the AGC signal surfaces based on affected stakeholder feedback and engagement, the CAISO would consider modifications to AGC and regulation performance in a separate initiative since such modification would have market wide implications. However, based on discussions and review of known customer issues to date, the CAISO found incorrect AGC signals were related to resources’ own programming errors.

The CAISO stresses the importance of actual data to help demonstrate both throughput and state of charge management issues. The CAISO requests that storage resource operators present data to the CAISO to help CAISO staff understand their specific issues and concerns. Such data and specific instances investigated will help the CAISO to determine if issues are isolated to operators, resources, or market design.

## 6 Future Considerations

The CAISO is aware of the growing number of energy storage and distributed energy resources and a future in which these resources will play an increasingly important role

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<sup>24</sup> Slide 3 of PG&E’s Jan 16, 2018 presentation “What Are the Capabilities of the NGR and REM Market Models for Batteries?” <http://www.aiso.com/Documents/Presentation-AlvaSvobodaPG-E.pdf>

in the future grid. The CAISO will continue to work with stakeholders to identify enhancements to the integration of energy storage and DERs through its demand response and NGR participation models. As stated in stakeholder comments, as well as throughout the proposal, certain issues are still to be determined. The CAISO will continue to look at topics under DR, MUA, and NGR to determine if a future initiative is necessary.

## Appendix A Acronyms

1. **AGC** – Automatic Generation Control
2. **BCR** – Bid Cost Recovery
3. **BPM** – Business Practice Manual
4. **BTM** – Behind The Meter
5. **CCA** – Community Choice Aggregation
6. **CCDEBE** – Commitment Cost Default Energy Bid Enhancements (policy initiative)
7. **CCE3** – Commitment Cost Enhancements Phase 3 (policy initiative)
8. **CLB** – Customer Load Baseline
9. **DAME** – Day-Ahead Market Enhancements (policy initiative)
10. **DERA** – Distributed Energy Resource Aggregation
11. **DLA** – Default Load Adjustment
12. **DLAP** – Default Load Aggregation Point
13. **DREM** – Demand Response Energy Measurement
14. **DRP** – Demand Response Provider
15. **DRRS** – Demand Response Registration System
16. **EVSE** – Electric Vehicle Supply Equipment
17. **FMM** – Fifteen-Minute Market
18. **IRP** – Imbalance Reserve Product
19. **LMP** – Locational Marginal Price
20. **LPA** – Load Point Adjustment
21. **LSE** – Load Serving Entity
22. **MEC** – Metered Energy Consumption (methodology)
23. **MGO** – Metered Generator Output (methodology)
24. **MOO** – Must Offer Obligation
25. **MUA** – Multiple-Use Application (CPUC Decision)
26. **NBT** – Net Benefits Test
27. **NGR** – Non-Generator Resource
28. **PDR** – Proxy Demand Resource
29. **PDR-LSR** – Proxy Demand Resource-Load Shift Resource
30. **RA** – Resource Adequacy
31. **RDRR** – Reliability Demand Response Resource
32. **RUC** – Residual Unit Commitment
33. **SC** – Scheduling Coordinator
34. **SIBR** – Software Infrastructure Business Rule (system)
35. **SOC** – State of Charge
36. **UIE** – Uninstructed Imbalance Energy

**Attachment D – Board Memorandum**

**Energy Storage and Distributed Energy Resources Phase 3 Tariff Amendment**

**California Independent System Operator Corporation**



# Memorandum

**To:** ISO Board of Governors

**From:** Keith Casey, Vice President, Market & Infrastructure Development

**Date:** August 29, 2018

**Re:** **Decision on the Energy Storage and Distributed Energy Resource phase 3 (ESDER 3) proposal**

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***This memorandum requires Board action.***

## EXECUTIVE SUMMARY

Management continues its efforts to lower barriers and enhance the ability of energy storage and distributed energy resources, including demand response, to participate in the ISO market through the energy storage and distributed energy resources phase 3 (ESDER 3) initiative. ESDER is an on-going stakeholder initiative to address market participation issues unique to demand response, non-generator resources, and distributed energy resource (DER) multi-use applications. This third phase of the initiative (ESDER 3) contains four elements requiring the Board of Governors' approval:

- 1) New bidding and real-time dispatch options for demand response
- 2) Removal of the single load serving entity aggregation requirement and the application of a default load adjustment
- 3) Load shift product for behind the meter energy storage
- 4) Performance evaluation methodology for behind the meter electric vehicle supply equipment load curtailment

The first element of the proposal provides demand response resources with additional bidding options to better align with certain resources' dispatch limitations. Stakeholders expressed concerns about the inability for certain demand response resources to respond to ISO dispatches in real-time due to insufficient notification time and recognition of their minimum run-time. To address these concerns, Management proposes to offer two new bidding options for proxy demand resources (PDR) that are modeled off the bidding rules applicable to inter-tie resources. Under the proposed bidding rules, PDRs will have the option to provide real-time market bids as an hourly block or as a 15-minute dispatchable

resource.<sup>1</sup> Choosing to be either an hourly block or 15-minute dispatchable resource provides PDRs with a longer dispatch notification time and a known minimum length of dispatch to respond to real-time dispatches.

The second element under the ESDER 3 proposal is a simplification of the registration rules and settlement mechanisms for aggregated demand response resources. The ISO currently requires demand response resource aggregations to be contained within a single load serving entity (LSE), represented by one demand response provider, and within a single sub-load aggregation point (sub-LAP).<sup>2</sup> The single LSE requirement stemmed from the ISO's application of a default load adjustment, which is a settlement mechanism to prevent a double payment for the load reduction of a demand response resource when it was provided during times found not to be net beneficial to the market. Stakeholders have expressed difficulty meeting or maintaining the minimum 100 kW threshold for demand response aggregations due to the migration of customers to new LSEs such as Community Choice Aggregators. Management proposes to remove the single LSE requirement for demand response aggregations, eliminate the need for a default load adjustment settlement mechanism, and institute a new bidding rule to ensure demand response resources bids are net beneficial to the system.

The third element of the proposal is a new product that will provide an opportunity for a behind the meter battery storage resources to consume energy during oversupply conditions and return that energy to the system during times of need. The new product, called the proxy demand resource – load shift resource (PDR-LSR), will enable such resources to bid and be dispatched for both load consumption (charging, negative generation) and load curtailment (discharging, generation) when the demand response resource is supported by a behind the meter battery storage device.

Finally, the fourth element of the proposal provides for separate load curtailment performance measurement of electric vehicle charge management through sub-metered electric vehicle supply equipment (EVSE). Stakeholders requested the ISO provide the means to recognize the distinct nature and performance of a sub-metered EVSE separate from the host facility's performance evaluation. Management proposes to leverage policy developed in ESDER 1, the metered generator output methodology, to develop a performance evaluation methodology for EVSEs.

Management proposes the following motion:

***Moved, that the ISO Board of Governors approves the Energy Storage and Distributed Energy Resource phase 3 proposal, as described in the memorandum dated August 29, 2018; and***

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<sup>1</sup> PDRs will still have the ability to respond to 5-minute real-time dispatches as they do today if those PDRs prefer to stay with existing bidding and dispatch rules and not elect to participate under these new bidding options.

<sup>2</sup> A sub-LAP is a sub-region of pricing nodes grouped by similar grid conditions within a default load aggregation point.

***Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the proposal, including any filings that implement the overarching initiative policy but contain discrete revisions to incorporate Commission guidance in any initial ruling on the proposed tariff amendment.***

## **DISCUSSION AND ANALYSIS**

### **1) New bidding and real-time dispatch options for demand response**

Management has recognized and worked towards resolving potential infeasible dispatch issues resulting from how the ISO's market optimization manages a demand response resource with a minimum operating level (Pmin) of 0 MW. Today, the ISO's market systems will issue a start-up instruction to a demand response resource to their Pmin, often 0 MW, well in advance of the commitment hour in the real-time market. This commitment ensures both start-up and minimum runtime constraints are met. Once these constraints are met, the optimization sees the resource as available for dispatch whenever the resource's energy bid is economic. This can result in 5-minute dispatch instructions with only a 2.5-minute notification time. Certain affected stakeholders have explained that this notification time is infeasible for many PDRs. In response, Management proposes to offer bidding options for PDRs that will provide longer notification times and extended real-time dispatch intervals, similar to what the ISO currently offers to inertia resources.

The two additional bidding options are:

**Hourly block** – The scheduling coordinator submits an hourly real-time market bid 75 minutes prior to the operating hour. If determined to be economic over the hour, the resource will be scheduled via the hour ahead scheduling process but will be settled at 15-minute market prices over the operating hour. The binding schedule is communicated to the scheduling coordinator at 52.5 minutes before the flow of energy. Because the resource is scheduled for the full hour, it will settle at the 15-minute market in real time making it a "price-taker" for the full hour.

**15-minute dispatchable** – The scheduling coordinator (SC) submits an hourly real-time market bid 75 minutes prior to the operating hour. If the 15-minute bid is economic, it will be dispatched and receive a binding schedule at the 15-minute market price. The dispatch notification is communicated 22.5 minutes before the flow of energy is expected.

Management believes that providing PDRs with the hourly and 15-minute economic bidding options currently available to inertia resources will allow certain PDRs that cannot respond to 5-minute dispatches to viably participate in the real-time market and increase resource performance. The new bidding options will also provide opportunities for participation from new demand response resources that were previously unable to align their resource performance with the current real-time bidding requirements.

## **2) Removal of the single load serving entity aggregation requirement and the application of a default load adjustment.**

The ISO currently requires demand response resource aggregations be contained within a single load-serving entity (LSE), represented by one demand response provider, and within a single sub-LAP. The ISO originally established the single LSE requirement in its PDR policy, later replicated in the reliability demand response resource (RDRR) policy, to facilitate the settlement application of an LSE-specific default load adjustment. The default load adjustment mechanism eliminates a double payment for a demand response resource when it is not net beneficial to all energy purchasers in terms of a wholesale market price reduction based on the demand response net benefits test, which was a test instituted by the Federal Energy Regulatory Commission.<sup>3</sup> The double payment occurs when the LSE gets credit for the load that does not show up in real-time in addition to the payment to the demand response provider. This double payment was determined by FERC to not be beneficial to the market if the demand response is dispatched at a bid price that does not have a significant impact on market clearing prices. At higher bid levels, demand response resources can have a greater impact on market clearing prices due to the shape of the resource supply curve. FERC defined that level at which demand response bids become net beneficial to the market, without the need for the default load adjustment, as the net benefits test threshold price.

The default load adjustment design feature required segmenting a demand response program into different aggregations by LSEs within a single sub-LAP. Demand response market participants raised concerns that this segmentation could potentially strand willing customer participants and affect the ability for some aggregators to meet the minimum market participation size requirement of 100 kW. In more specific cases, demand response providers establishing new resource aggregations expressed difficulty meeting, or maintaining, the 100 kW minimum participation requirement as customers are defaulted or moved to new LSEs, such as to a Community Choice Aggregator (CCA). Therefore, Management proposes to remove the single LSE requirement for demand response aggregations as well as remove the application of the default load adjustment settlement mechanism and institute a bidding rule that requires proxy demand resources bid at or above the net benefits test price threshold.

Management believes removing the default load adjustment settlement mechanism is necessary because the allocation of costs becomes too complex to implement and manage across multiple LSEs under a single demand response aggregation. In support of removing the default load adjustment, data analysis shows that the settlement implications have historically been de minimis relative to the benefits achieved by eliminating the one LSE per demand response aggregation requirement. To ensure that demand response resources are bidding beneficially to the market, Management proposes to utilize the net benefits test threshold price to screen submitted demand response bids to ensure they are at or above

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<http://www.caiso.com/informed/Pages/StakeholderProcesses/CompletedClosedStakeholderInitiatives/DemandResponseNetBenefitsTest.aspx>

the threshold price in compliance with FERC Order No. 745. The bidding requirement will ensure demand response resources are net beneficial to the system when submitting bids to the ISO rather than an after-the-fact assessment in the settlement system currently conducted through the default load adjustment. The ISO will use the existing monthly calculation of the net benefits test and its resulting on-peak and off-peak threshold prices to validate bid submissions in the day-ahead and real-time markets to ensure all energy bids from proxy demand resources are at or above the net benefits threshold price.

### **3) Load shift product for behind the meter energy storage**

Management proposes to develop a load shift product for behind the meter storage devices under the PDR demand response participation model. The load shift product will fall under existing PDR policy provisions with new functionalities to enable the resource to bid and be dispatched for both load consumption (charging, negative generation) and load curtailment (discharging, generation) from a behind the meter battery storage resource. The initial product will allow a PDR to access day-ahead and real-time energy markets for both load curtailment and load consumption through the use of two separate resource IDs. The proposal will facilitate the provision of “shift” services while maintaining a demand response policy that injection or export of behind the meter energy storage beyond the retail meter is not eligible for wholesale market compensation, nor is energy associated with typical use for non-ISO purposes, such as customer demand and energy management.

The PDR-LSR will be designed as two discrete resource IDs utilizing specific bidding rules and parameters to prevent scenarios where both resource IDs are given conflicting dispatches. The resource ID for curtailment (discharging, generation) will be allowed to bid from the net benefits test price up to the ISO bid cap and the resource ID for consumption (charging, negative generation) will be allowed to bid from less than \$0 down to the bid floor (currently at -\$150). In addition to specific bidding rules, the resource ID for curtailment must register with a Pmin of 0 MW and the ISO will enforce ramping capabilities for each resource ID.

The PDR-LSR will be settled using the meter on the storage device, subtracting off any typical use (i.e., for non-ISO purposes) such as customer energy and demand management. This subtraction of typical use ensures the ISO is not compensating for services provided for other purposes, under a multiple use application. The typical use is calculated using a 10-in-10 customer load baseline methodology. The 10-in-10 methodology estimates what electricity use would typically have been during the relevant settlement intervals but for an ISO dispatch instruction. The subtraction of typical use is an existing and FERC-approved settlement construct that is applied today to proxy demand resources that elect the meter generator output performance evaluation methodology. Specific to PDR-LSRs, Management proposes to modify the existing 10-in-10 “typical use” baseline methodology to account for both charge and discharge values when establishing the typical use value. Specifically, when the simple average of typical energy use is opposite to the ISO dispatch, the value is adjusted to zero. In other words, if the device is typically charging when the ISO

instructs the resource to discharge, the ISO will set the typical use to zero, expecting energy to be delivered equal to the ISO dispatch instruction.

#### **4) Performance evaluation methodology for behind the meter electric vehicle supply equipment load curtailment**

In ESDER phase 1, Management proposed the meter generator output (MGO) performance measurement, which uniquely recognizes a sub-metered storage device's contribution to a facility's overall load curtailment during an ISO dispatch event. Certain stakeholders requested that the ISO extend the MGO concept to sub-metered electric vehicle service equipment (EVSE) load curtailment.

Management proposes to enable EVSE sub-metering and extend the MGO performance method for EVSE market participation independent of, or in combination with, its host customer. Currently, EVSEs or any sub-metered device can already participate using the MGO provisions, but the ISO currently cannot accommodate a sub-metered resource with a different performance evaluation methodology than its host facility load, which many desire for EVSEs. Sub-metering resolves many issues including the lack of fifteen-minute interval metering at the host facility for measurement of curtailment in five-minute intervals, enabling direct measurement of the actual EV load curtailment achieved, and creating a more tailored market participation model for EVSEs. The proposal includes implementing two additional day-matching customer load baselines to accommodate for EVSEs in the residential and non-residential sector.

### **POSITIONS OF THE PARTIES**

Stakeholder comments were generally supportive of ESDER 3's proposal with the exception of one stakeholder opposing the EVSE element of the proposal.

Under the proposal for a load shift product for behind the meter energy storage, a majority of stakeholders support the calculation of a typical use as an important and reasonable settlement construct. One stakeholder, Stem, representing storage resource interests, does not support the proposed treatment of typical use under the PDR-LSR option.

Stem believes that if their storage device is typically charging when the ISO dispatches the device to discharge, then it should be credited for its typical use. In other words, if the ISO dispatched Stem's storage device to discharge 25 kW, and the typical use calculation shows the device typically charges at 25 kW of energy in this same interval, then Stem should have no obligation to deliver actual energy; they simply must stop charging the battery to fulfill the ISO's dispatch instruction.

Stem's proposal is problematic for several reasons. Currently, there is a fundamental misalignment between retail rates and the needs of the bulk grid, which creates perverse

incentives and outcomes that are not rational from an overall system perspective. Most LSE retail time of use (TOU) rates continue to identify 12 noon to 6 PM as a peak period, meaning customers are incented to conserve during periods of over supply when the bulk system needs consumption. Retail partial peak periods occur after 6 PM, just when the ISO is experiencing the net peak demand, i.e. from 4 PM to 9 PM. From 4 PM to 9 PM, the ISO generally needs conservation and wants storage devices to discharge. The PDR-LSR option is designed to help the ISO address over-supply and store negatively priced energy during over-supply conditions, and preferably, deliver that energy back to the system in times of need. Unfortunately, current TOU rates provide storage a very strong retail incentive to do the opposite of the what the bulk power system needs — to discharge the storage device to manage a customer's peak demand during peak solar output periods (belly of the duck) and to charge during the evening net load ramp period when solar output tails off and loads continue to be high (neck of the duck) — the opposite of what is needed for reliability. The misalignment of retail TOU rate periods and ISO bulk system needs creates opportunities where it is both advantageous to charge and at the same time be paid by the ISO to stop charging, since the charging exacerbates the net load ramp in the first instance. This is a perverse incentive that should not be supported as an ISO performance evaluation method. To address this, Management's proposal sets any typical consumption of a PDR-LSR to zero when settling the battery for its discharged energy. This prevents the gaming opportunity described above, and ensures actual energy is delivered in response to an ISO dispatch instruction.

Second, Stem argues this is discriminatory treatment of PDR-LSRs since traditional demand response is credited for its typical use. However, behind the meter energy storage device is different from traditional demand response because it is able to shift and store energy dynamically. Traditional demand response must curtail load, i.e., it must turn off actual load in response to an ISO dispatch instruction, thus reducing production, service, or comfort in exchange for a wholesale payment. In other words, traditional demand response cannot sit idle in response to a dispatch instruction and get credit for its typical use. Services must be curtailed and actions must be taken to intentionally reduce load below the customer's typical use baseline.

Third, the incentives for storage to charge when the system needs it to discharge, and vice versa will be mitigated when retail rates and the needs of the bulk power system are more closely aligned. With retail rate alignment, there should be limited instances and incentives for a battery's typical use to be in the opposite direction of the bulk power system's needs. Therefore, Management's typical use baseline applied to the proposed PDR-LSR option is appropriate and helps prevent these gaming opportunities under the current retail rate construct.

Management's concerns and justifications in response to Stem's position is generally supported by stakeholders and by the Department of Market monitoring.

Under the proposal for a performance evaluation methodology for a sub-metered EVSE, a majority of stakeholders have given general support for the proposal with the exception of

Southern California Edison (SCE). SCE opposes the proposal based on its concerns with a potential scenario where an EVSE participating in the wholesale market would not provide a full load drop because it could potentially disconnect from one EVSE and, in turn, connect to a non-participating EVSE. Management believes that the scenario posed by SCE is a highly unlikely scenario based on several discussions with stakeholders throughout the process. Management does not believe that there is an economic incentive nor a technologically feasible implementation for an EVSE owner to switch electric vehicles to non-participating EVSEs in response to ISO market dispatches. Pacific Gas & Electric requested as a condition to supporting Management's proposal, an attestation be required for EVSE participants when registering and submitting its ISO settlement quality meter data plan that they will provide curtailments of the EVSE consistent with their dispatch. Management has included this requirement in its proposal to disincentivize the practice of not providing full load curtailment by PDRs electing to register under the EVSE option.

Management addresses additional stakeholder comments in Attachment A.

## **CONCLUSION**

Management requests the Board approve its proposal for the provision of two new bidding options for PDRs, eliminating the single LSE requirement and DLA settlement mechanism, the load shift product for behind the meter energy storage devices, and establishing performance evaluation methodologies to recognize an EVSE's load curtailment distinct from its host facility. The proposed enhancements will provide energy storage resources and distributed energy resources more opportunities to efficiently participate in the ISO market.