UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

ELECTRIC STORAGE PARTICIPATION IN REGIONS WITH ORGANIZED WHOLESALE ELECTRIC MARKETS	**)** **)** **)** **)**	**DOCKET NO. AD16-20-000**

RESPONSE OF
THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION
TO DATA REQUEST

The California Independent System Operator Corporation ("CAISO") hereby files this response to the data request received from the Director of the Federal Energy Regulatory Commission's Office of Energy Policy and Innovation on April 11, 2016 in the above-captioned proceeding.[1]

General Response

To date, the Commission has provided the CAISO with the regional flexibility necessary to develop market rules and participation models that can keep pace with the constant innovation in the electric storage landscape. As described in detail in the CAISO's responses to questions 1 and 2 in the section entitled *Potential Changes to the Rules Affecting Electric Storage Resources*, the CAISO has conducted a number of its own stakeholder initiatives and has worked with the California Public Utilities Commission ("CPUC") and the California Energy Commission ("CEC") on joint electric storage initiatives. As a result, electric storage resources are able to tailor their

[1] All capitalized terms not herein defined have the meanings set forth in Appendix A to the CAISO tariff.

participation in the CAISO markets based on their unique features, including electrical constraints, location, and whether they are stand-alone resources or operate in tandem with other resources such as renewable generation or electrical-vehicle charging stations. The CAISO appreciates the regional flexibility provided by the Commission, and respectfully requests that it continue to provide this flexibility to the CAISO and organized markets.

The Eligibility of Electric Storage Resources to be Market Participants

1. **If electric storage resources are eligible to qualify as sellers in the capacity, energy, and/or ancillary service markets, please indicate the resource types (e.g. limited energy resource, generator, demand response, etc.) for which they may qualify in each market. In addition, please list where each applicable resource type is defined in the tariff, as well as the criteria for qualifying as each resource type.**

As explained in detail below, electric storage resources are eligible to qualify as sellers in the CAISO energy and ancillary service markets. In fact, electric storage resources may avail themselves of a variety of participation models depending on their physical characteristics and how they wish to participate in the CAISO markets. Generally, electric storage resources participate in the CAISO markets as Non-Generator Resources, Pumped Storage Hydro Units, or as one of the CAISO's two demand response entities: Proxy Demand Resources or Reliability Demand Response Resources.[2] The CAISO also recently filed tariff revisions in Docket ER16-1085 to support the aggregation of distributed energy resources, including storage, seeking to

[2] Electric storage resources also may participate as Participating Generators, if they so elect.

participate in the CAISO's markets.[3] Under this framework, distribution-connected electric storage resources could aggregate with other distributed energy resources and participate in the CAISO's markets as an aggregated resource.

The CAISO tariff defines Non-Generator Resources as "Resources that operate as either Generation or Load and that can be dispatched to any operating level within their entire capacity range but are also constrained by a MWh limit to (1) generate Energy, (2) curtail the consumption of Energy in the case of demand response, or (3) consume Energy."[4] The CAISO created the Non-Generator Resource model to allow greater participation in the CAISO markets following Order Nos. 719 and 890.[5]

The Non-Generator Resource model supports smaller, energy-constrained resources to qualify for day-ahead ancillary services awards and continuous energy output requirements for providing ancillary services.[6] The Non-Generator Resource model recognizes that a resource can operate seamlessly across a resource's entire operating range. In the case of electric storage resources, this operating range can reflect both charging and discharging configurations. For example, battery storage is a resource which can discharge energy in one interval as positive generation and consume energy in the next interval as negative generation. Current battery chemistries and storage control systems have demonstrated that these resources can

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3 *See*, CAISO tariff filing dated March 2, 2016 in ER16-1085 http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14163686

4 Appendix A to the CAISO tariff.

5 *Cal. Indep. Sys. Operator Corp*., 137 FERC ¶ 61,165 (2011); *Cal. Indep. Sys. Operator Corp.,* 132 FERC ¶ 61,211 (2010).

6 Appendix A to the CAISO tariff; Section 4.6 of the CAISO tariff.

move nearly instantaneously between positive and negative generation, have fast ramping rates, and can be controlled to a high degree of precision and performance accuracy. While storage technology is an ideal candidate for the Non-Generator Resource model, the model also may benefit other energy constrained resources such as dispatchable demand response or microgrids that have limited ability to generate or consume energy continuously for wholesale market participation purposes.

Non-Generator Resources also may elect to use the CAISO's Regulation Energy Management functionality, which allows Non-Generator Resources to bid their capacity more efficiently in the CAISO's day-ahead regulation markets.[7] Non-Generator Resources that select this option can participate in the CAISO's regulation markets only. Under this functionality, the CAISO uses a real-time energy offset to help these resources manage the continuous energy requirements for providing regulation service.

The following table, currently available in Section 4.1.1 of the CAISO's Business Practice Manual for Market Instruments, outlines the bidding and participation options for Non-Generator Resources depending on whether they do not elect to use Regulation Energy Management (Non REM) or elect to use Regulation Energy Management (REM).

Bid component	Allowed for non REM?	Allowed for REM?	Comment
Start-Up	No	No	By nature NGRs do not have startup costs.
Minimum Load	No	No	By nature NGRs do not have minimum load costs.
Transition Costs	No	No	By nature NGRs do not have transition costs.

[7] Section 8.4.1.2 of the CAISO tariff.

Bid component	Allowed for non REM?	Allowed for REM?	Comment
Energy Bid Curve	Yes	No	NGRs selecting the REM option are not allowed to participate in the energy market.
Self-Schedule	Yes	No	Because NGRs selecting the REM option are not allowed to participate in the energy market, they cannot self-schedule. Non REM NGRs can self-schedule as price takers only.
Ancillary Services			NGRs are not allowed to self-provide Ancillary Services
Regulation Down	Yes	Yes	
Regulation Up	Yes	Yes	
Spinning Reserve	Yes	No	NGRs selecting the REM option are only allowed to supply regulation.
Non-Spinning Reserve	Yes	No	NGRs selecting the REM option are only allowed to supply regulation.
Operational Ramp Rate	Yes	Yes	NGRs are limited to two segments.
Operating Reserve Ramp Rate	No	No	NGRs are not allowed to submit Operating Reserve Ramp Rates. Operational Ramp rate shall be used for procurement of AS.
Regulation Ramp Rate	No	No	NGRs are not allowed to submit Regulation Ramp Rates. Operational Ramp rate shall be used for procurement of AS.
Contingency Dispatch Indicator	Yes	N/A	Does not apply to REM resources because they cannot supply spinning or non-spinning reserve.
Intertie Minimum Hourly Block	N/A	N/A	Does not apply to NGRs because NGRs must be located within the CAISO balancing authority.

Bid component	Allowed for non REM?	Allowed for REM?	Comment
Dispatch Option	N/A	N/A	Does not apply to NGRs because NGRs must be located within the CAISO balancing authority.
Pump Shut-Down Cost	No	No	By nature NGRs do not have pump shut-down costs.
Pumping Cost	No	No	By nature NGRs do not have pumping costs.
Daily Energy Limit (Maximum and Minimum Daily)	No	No	However NGRs do bid an upper and lower charge limit, which is a similar concept.
RUC	No	No	
Capacity Limit	Yes	Yes	
Distribution Factors	Yes	Yes	Assumption is that all underlying resources are operating in the same mode, either all must be in charging mode or all must be in discharging mode.
VER Forecast	N/A	N/A	Does not apply to NGRs because NGRs cannot be a VER.
The following bid components apply to NGRs only			
Lower Charge Limit	Yes	Yes	Lowest stored energy that should be maintained in the device. Cannot be lower than the minimum stored energy value registered in the Master File.
Upper Charge Limit	Yes	Yes	Highest stored energy that should be maintained in the device. Cannot be higher than the maximum stored energy value (MSE) registered in the Master File.

This month the CAISO intends to file proposed tariff revisions reflecting policy approved by the CAISO Board of Governors from Phase 1 of the CAISO's Energy

Storage and Distributed Energy Enhancements stakeholder initiative ("ESDER").[8] These proposed revisions will include enhancements to the Non-Generator Resource model that will provide scheduling coordinators with the ability to submit storage resources' state-of-charge as a bid parameter, as well as manage their MWh energy limits in real-time.[9]

In addition, energy storage resources — particularly those that exist behind a retail customer meter and/or smaller resources that wish to aggregate into a resource that can participate in the wholesale markets — also can participate by providing load curtailment (i.e., demand response) as Proxy Demand Resources or Reliability Demand Response Resources. Proxy Demand Resources and Reliability Demand Response Resources may participate and bid in the CAISO markets as outlined in Sections 4.13 and 30.6 of the CAISO tariff. The proposed tariff revisions resulting from Phase 1 of the ESDER initiative also will include enhancements to these demand response models specifically to accommodate the proliferation of behind-the-meter generation and storage devices configured to participate as demand response resources. The CAISO worked with stakeholders to tailor the North American Energy Standards Board ("NAESB") metering generator output measurement and verification methodologies for

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[8] More information is available on the CAISO's Energy Storage and Distributed Energy Enhancements stakeholder initiative at the following website: https://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorage_DistributedEnergyResourcesPhase1.aspx.

[9] *See* Memorandum to CAISO Board of Governors, https://www.caiso.com/Documents/Decision_EnergyStorage_DistributedEnergyResourcesProposal-Memo-Feb2016.pdf.

the CAISO markets.[10] These performance evaluation methodologies will accommodate sub-metering and will allow the CAISO to ascertain demand response performance based upon the gross load independent of behind-the-meter generation, the behind-the-meter generator output itself, or both.

The CAISO also has proposed tariff rules to facilitate participation in its markets by small distribution-connected resources, including electric storage, through aggregation. These proposed rules are set forth in section 4.17 as well as other sections of the tariff as specified in the CAISO's March 4, 2016 filing in Docket ER16-1085.

In addition, the CAISO has a distinct participation model for Pumped Storage Hydro Units, which are hydroelectric dams with the capability to produce electricity and the ability to pump water between reservoirs at different elevations to store such water for the production of electricity.[11] This model reflects the unique physical and market characteristics of pumped storage: Pumped-Storage Hydro Units can operate in the mode of Generating Unit or Participating Load and can submit bid components for both modes. In addition to the start-up cost components and the minimum load cost components (associated with operating in generating mode), Pumped-Storage Hydro Units submit additional bid components to reflect their shut-down costs, pumping levels, and hourly pumping costs.[12]

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[10] See North American Electric Standards Board Inc., WEQ-015, Section 015-1.28 (Sep. 30, 2015).

[11] Appendix A to the CAISO tariff.

[12] *See* Section 5.1.1.2.4 of the CAISO BPM for Market Instruments.

2. **Are certain types of resources ineligible to participate as sellers in the capacity, energy, or ancillary service markets by definition? If so, please explain which types of resources are ineligible to participate in which markets and why, including citations to any authority for such ineligibility (e.g., NERC standards, etc.).**

The CAISO's tariff does not designate certain resource types as ineligible to provide energy or ancillary services. The CAISO tariff instead includes rules establishing requirements for resources to participate in its energy and ancillary services markets.[13] The CAISO tariff also includes rules establishing requirements for resources to participate as resource adequacy resources.[14] These rules, however, do not exclude certain resources from participation based on their resource type.

3. **To the extent that electric storage resources are *ineligible* to qualify as sellers in the capacity, energy and ancillary service markets for a resource type, please explain why.**

Electric storage resources are eligible to qualify as sellers in the CASIO's energy and ancillary services markets consistent with the technical requirements applicable to other resource types.

4. **When electric storage resources are eligible to participate in the capacity, energy, and ancillary services markets, are there different rules for different types of electric storage resources? For example, are there different qualification or performance requirements for batteries versus pumped storage resources? If so, please state these rules and explain the distinctions they draw for the participation of different types of electric storage resources.**

The CAISO tariff rules governing participation in the CAISO's energy and ancillary services markets apply to all resources. The tariff does not establish different

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[13] *See* Appendix K to the CAISO tariff (listing eligibility requirements to provide ancillary services).

[14] *See* Section 40.4 of the CAISO tariff (listing eligibility requirements to provide resource adequacy).

rules for different types of electric storage resources. As explained in detail in the CAISO's response to question 1, above, the CAISO models different types of electric storage resources in different ways. For example, the CAISO models pumped storage resources to recognize their operating abilities and constraints in pumping and generation mode. The CAISO models battery storage resources to recognize their ability to operate continuously across a capacity range subject to MWh limits.

5. **Can electric storage resources set the price in the capacity, energy, and ancillary service markets? If not, please explain all circumstances under which electric storage resources are not eligible to set the market-clearing price.**

Electric storage resources can set the marginal price of energy and ancillary services in the CAISO's markets based on their economic bids, if they are the marginal resource.

Qualification Criteria and Performance Requirements

1. **What are the minimum capacity requirements and minimum offer sizes to sell capacity, energy, and ancillary services?**

The CAISO applies the same minimum capacity requirements and minimum offer sizes to all resources seeking to participate in its market.[15] The CAISO's tariff identifies a minimum resource capacity size of 0.5 MW, although resources can meet this minimum capacity size requirement through an aggregation.[16] The minimum resource size for Proxy Demand Resources and Reliability Demand Response Resources, which can include participation by electric storage resources, is 100kW or 0.1 MW.

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[15] Proxy Demand Resources and Reliability Demand Response Resources have separate requirements, as described in Section 4.13 of the CAISO tariff.

[16] CAISO tariff, Appendix K, Part A 1.1.1; Part B1.1; Part C 1.1.

Resources seeking to provide ancillary services must be at least 0.5 MW, although resources can meet this minimum capacity assize requirement through an aggregation.[17] The minimum bid for all resources in the CAISO's market will accept is 0.01 MWh.

All resources seeking to provide ancillary services must meet the same continuous energy requirements. The following requirements apply:

Regulation Up and Regulation Down:

Day-ahead = 60 minutes[18]

Real-Time = 30 minutes

Spinning Reserve and Non-Spinning Reserve = 30 minutes

2. What are the technical qualification criteria for each type of resource eligible to participate in the capacity, energy, and ancillary service markets, as applicable?

Electric storage resources are treated on a comparable basis to other resources when determining eligibility for participation.[19] In addition to the minimum capacity requirements and minimum offer sizes listed above, resources seeking to provide

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17 *Id.*

18 Resources with MWh constraints may more efficiently satisfy the continuous energy requirements for regulation up and regulation down in the day-ahead market if they elect to use Regulation Energy Management functionality. For example, a resource with the capability to provide 20 MW for 15 minutes would normally only be able to offer 5 MW of capacity into the CAISO's regulation market. With the use of a real-time energy offset, the CAISO's Regulation Energy Management functionality permits this resources to bid its full 20 MW of capacity into the CAIS)'s day-ahead market for regulation.

19 It should be noted that aggregations of Proxy Demand Resources, Reliability Demand Response Resources, and Distributed Energy Resources (as proposed) are limited to sub-LAPs, but these participation models are not resource-specific and the sub-LAP restriction would therefore also be limited to traditional generation types.

energy must be able to comply with general operating requirements for generation.[20] These requirements may vary slightly depending on whether the resource is interconnected to the transmission or distribution grid,[21] part of an aggregation,[22] or under 1 MW in capacity.[23] Generally, generation resources must be able to comply with all CAISO operating dispatches,[24] provide telemetry,[25] have a scheduling coordinator,[26] and be located within the CAISO balancing authority area.[27] Similarly, electric storage resources seeking to provide Resource Adequacy must comply with the general eligibility requirements in Section 40.4 of the CAISO tariff. To provide ancillary services in addition to the minimum capacity and offer size listed above, resources must be able to meet the eligibility requirements listed in Appendix K to the CAISO tariff (depending on the type of ancillary services offered).[28]

3. What are the technical performance requirements for providing capacity, energy, and ancillary services in CAISO's markets, as applicable?

See response to question 2, above. For ancillary services, the CAISO conducts performance audits of dispatched resources to assess whether they provided at least 90

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20 *See* Section 4.6 of the CAISO tariff.

21 Section 4.6.3.1 of the CAISO tariff.

22 Section 4.6.3.2 of the CAISO tariff.

23 *Id*.

24 Section 4.6.1.1 of the CAISO tariff.

25 Section 7.6.1 of the CAISO tariff.

26 Section 4.6 of the CAISO tariff.

27 *Id.*

28 *See* Appendix K to the CAISO tariff, Part A (Regulation), Part B (Spinning Reserve), and Part C (Non-spinning Reserve).

percent of their spinning reserve and non-spinning reserve awards within 10 minutes.[29] For regulation up and regulation down, the CAISO applies a minimum performance threshold that requires resources to respond with at last 25 percent accuracy to the CAISO's control signal during a calendar month.[30]

4. **What are the bases for these qualification and performance standards (e.g., North American Electric Reliability Corporation (NERC) reliability standards)? Please provide the technical and operational justifications for these qualification and performance standards, with citations if possible.**

Technical qualification and performance standards are based on NERC and WECC reliability standards, NAESB models, Commission orders, and other market and operating rules approved by the CAISO Board of Governors resulting from CAISO stakeholder processes. Providing the basis for all CAISO technical and performance standards calls for a significant amount of information. If the Commission seeks information on a specific qualification or performance standard, the CAISO will supplement this answer.

Bid Parameters for Electric Storage Resources

1. **What are the required bid parameters for each defined resource type to sell in the capacity, energy and ancillary service markets? Are there additional bid parameters that each defined resource type may submit? Are there any bid parameters unique to electric storage resources in each market?**

Bid parameters for CAISO resource types are listed in Section 30 of the CAISO tariff. As described in the response to question 1 under the section entitled *the Eligibility of Electric Storage Resources to be Market Participants*, above, energy storage

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29 *See* CAISO Operating Procedure 5370, Section 3. http://www.caiso.com/Documents/5370.pdf

30 *See* CAISO tariff section 8.2.3.1.1.

resources generally participate in the CAISO markets as Non-Generator Resources, Pumped-Storage Hydro Units, or by providing load curtailment as Proxy Demand Resources or Reliability Demand Response Resources. The CAISO intends to propose tariff revisions to Section 30 in its upcoming filing to incorporate the ESDER Phase 1 proposal to allow scheduling coordinators representing Non-Generator Resources to include state-of-charge as a bid parameter.

Distribution-Connected and Aggregated Electric Storage Resources

1. **Are there opportunities for electric storage resources connected to the distribution system, or a subsystem thereof, to participate in the capacity, energy, and ancillary service markets? If so, please describe those opportunities (i.e., in which markets, as what type of resource, and subject to what tariff provisions may such electric storage resources participate?).**

Distribution-connected electric storage resources can participate in the CAISO's energy and ancillary service markets as a Non-Generator Resource or Proxy Demand Resource subject to applicable requirements. Please see response to question 1 of this data request under the section entitled *the Eligibility of Electric Storage Resources to be Market Participants.*

2. **Are there opportunities for aggregated electric storage resources to participate in the capacity, energy, and ancillary service markets? If so, please describe those opportunities (i.e., in which markets, as what type of resource, and subject to what tariff provisions may such electric storage resources participate?).**

The CAISO has proposed tariff revisions in Docket ER16-1085 to facilitate the participation of distribution-connected electric storage resources through an aggregation. Please see response to question 1 of this data request under the section entitled the Eligibility of Electric Storage Resources to be Market Participants.

3. If electric storage resources are providing services to the wholesale market and to another entity (e.g., a distribution utility), and if there are tariff provisions that permit or penalize potential deviation from the RTO/ISO economic dispatch signal in that circumstance, please provide them.

The CAISO examined this issue closely in Phase 1 of its ESDER stakeholder initiative for those resources that are *not* providing Resource Adequacy. In consultation with stakeholders, the CAISO concluded that it should continue to settle CAISO dispatches in the same manner as other generating resources. If the energy storage resource deviates from a CAISO dispatch instruction to provide service to the distribution system or for another reason, its deviation will be settled as Uninstructed Imbalance Energy.

In addition, one of the proposals resulting from Phase 1 of ESDER will be the use of metering generator output measurement and verification methodologies for demand response providers.[31] These performance evaluation methodologies will accommodate sub-metering and will allow the CAISO to ascertain demand response performance (i.e., retail consumption) based upon the gross load independent of behind-the-meter generation, the behind-the-meter generator output itself, or both.

The CAISO currently is examining this issue for resources providing Resource Adequacy in Phase 2 of its ESDER stakeholder initiative and the CPUC's proceeding on future energy storage procurement: CPUC Docket No. (R.)15-10-033.

[31] See North American Electric Standards Board Inc., WEQ-015, Section 015-1.28 (Sep. 30, 2015).

When Electric Storage Resources are Receiving Electricity

1. **Under what circumstances would an electric storage resource submit bids to buy energy in the wholesale markets (i.e., when would an electric storage resource be a wholesale buyer under CAISO's market rules/tariff)?**

A storage resource interconnected to the CAISO grid with a participating generator agreement and participating load agreement would submit bids to sell and buy energy in the wholesale market.

A storage resource interconnected at the distribution system level with the appropriate interconnection agreement with the distribution utility and properly completing the CAISO new resource implementation process may elect to participate with the CAISO and submit bids to sell and buy energy in the wholesale market as a wholesale market resource.[32] At this time, these resources would be CAISO participating resources and would not support multiple uses such as serving behind-the-meter load or distribution services.

2. **If electric storage resources must bid to buy electricity from CAISO's market, what are the minimum load obligations, minimum bid sizes, or other minimum parameters to buy electricity in each market? For example, is there a minimum consumption limit to be eligible to pay the locational marginal price (LMP) for energy or a minimum charging duration that must be met to be a wholesale buyer?**

The minimum participation requirements are the same as for a traditional generator supplying energy: 0.5 MW/500kW capacity and bids of 0.01MW/10 kW. Please see the CAISO's response to question 1 under the section entitled *Qualification Criteria and Performance Requirements*.

[32] This issue is currently before the Commission in Docket No. ER16-1085-000.

3. **Do electric storage resources participating in the capacity, energy, and ancillary service markets always pay LMP for the electricity they receive, and if not, under what circumstances do they not?**

Storage resources participating in the CAISO's capacity, energy, and ancillary services market always pay LMP for energy procured for wholesale injection into the CAISO grid, as metered by the CAISO. At this time, these resources would be CAISO participating resources and would not support multiple uses.[33]

4. **Are there circumstances when an electric storage resource receives energy but is not considered load and therefore does not pay for its consumption? For example, if an electric storage resource provides frequency regulation and is asked to receive energy (i.e., provide regulation down) is that considered consumption or provision of frequency regulation, and is the resource charged a wholesale rate for this action?**

An electric storage resource that provides regulation down service in the CAISO market will consume energy in response to that dispatch instruction and must pay the applicable LMP for that energy. Likewise, an electric storage resource that participates in the CAISO's energy market and consumes in response to a CAISO dispatch instruction will pay the LMP for the energy.[34] This energy constitutes a sale of power for later resale back to the CAISO market.

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[33] Behind-the-meter storage resources could procure power at something besides LMP to the extent that they "participate" in CAISO markets.

[34] The CAISO generally collects meter data and settles generation in 5-minute intervals, so an energy storage resource that both charged and discharged during a settlement interval would be settled based upon its net performance during the interval. *See* Sections 10.2.9.2 and 10.3.2.1 of the CAISO tariff.

Potential Changes to the Rules Affecting Electric Storage Resources

1. **Are there any forthcoming or pending proposals or on-going stakeholder processes that could change or contemplate changing the rules by which electric storage resources can sell into CAISO's markets? If so, please describe the proposals or stakeholder processes briefly and provide citations to any relevant websites or public documents.**

The CAISO has been working to develop rules and participation models tailored to the unique aspects of energy storage, both for resources connected to the transmission system and the distribution system. The CAISO developed the framework for the Non-Generator Resource model in 2010 in response to the directives of Order Nos. 719 and 890 to facilitate the provision of ancillary services by non-generator resources.[35] In 2011 the CAISO created the Non-Generator Resource model and detailed the procedures for non-generator resource market participation, including the use of regulation energy management functionality.[36]

In 2014 the CAISO conducted three stakeholder initiatives related to energy storage. First, the CAISO conducted an energy storage interconnection initiative to examine potential issues with energy storage resources' interconnecting to the CAISO

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35 *Cal. Indep. Sys. Operator Corp.*, 132 FERC ¶ 61,211 (2010).

36 *Cal. Indep. Sys. Operator Corp.*, 137 FERC ¶ 61,165 (2011). Scheduling coordinators for non-generator resources may request to certify resources as those that use regulation energy management in order to provide regulation service consistent with the continuous energy requirements. Regulation energy management is "a market feature for resources located within the CAISO Balancing Authority Area that require Energy from the Real-Time Market to offer their full capacity as Regulation." Resources that choose to use regulation energy management must sign a participating generator agreement or a participating load agreement. The resources that choose to use regulation energy management must also define their ramp rate for operating as generation and load and allow CAISO to control their operating set point. *See* CAISO tariff Appendix A; tariff section 8.4.1.2.

controlled grid.[37] This initiative ultimately concluded that the CAISO's existing interconnection rules and study processes could accommodate energy storage resources, and the CAISO added guidance to storage resources on several topics in its BPMs. Second, the CAISO conducted a distributed energy resource provider initiative to allow distributed energy resources—including energy storage resources—to aggregate into consolidated resources and meet the CAISO's minimum capacity requirement of 0.5 MW. These resources will thus be able to play a role in the reliability of the transmission grid and participate in the wholesale market.[38] The CAISO submitted the resulting tariff revisions to the Commission on March 4, 2016.[39] Third, in collaboration with the CPUC and the California Energy Commission, the CAISO completed the California Energy Storage Roadmap, which outlines ways to (1) expand revenue opportunities for energy storage resources; (2) reduce their costs of integrating and connecting to the grid; and (3) streamline and elucidate policies to increase certainty.[40]

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 storage-related issues. This first

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37 http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorageInterconnection.aspx.

38 https://www.caiso.com/informed/Pages/StakeholderProcesses/ExpandingMetering-TelemetryOptions.aspx.

39 *Cal. Indep. Sys. Operator Corp.*, Tariff Filing on Distributed Energy Resource Provider Initiative, Docket No. ER16-1085-000 (March 4, 2016).

40 https://www.caiso.com/Documents/Advancing-MaximizingValueofEnergyStorageTechnology_CaliforniaRoadmap.pdf.

phase focused on the Non-Generator Resource and demand response enhancements proposed herein, as well as clarifications on the rules for "multiple-use applications," namely resources capable of providing service to end-use customers, as well as the distribution and transmission systems.[41] The CAISO plans to file the proposed tariff revisions resulting from Phase 1 of the ESDER initiative imminently. The CAISO currently is conducting Phase 2 of the ESDER initiative, which may result in further enhancements.[42]

In addition, the CAISO is an active participant in several CPUC proceedings related to energy storage and distributed energy resources. The CAISO recently held a joint workshop with the CPUC examining the challenges of multiple-use applications for storage and how station power rules may apply to storage.[43]

2. **Are there any forthcoming or pending proposals or on-going stakeholder processes that could change or are contemplating changing the rules by which electric storage resources buy electricity from CAISO's market? If so, please describe the proposals or stakeholder processes briefly, and provide citations to any relevant websites or public documents.**

As mentioned above, Phase 2 of the ESDER initiative will examine whether the CAISO should revise its tariff provisions on station power. Because such revisions would have to be consistent with state/retail tariffs, the CAISO actively participates in the CPUC's proceeding on future energy storage procurement, which also is examining

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41 The examination of multiple-use application rules did not result in tariff revisions.

42 http://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorage_DistributedEnergyResourcesphase2.aspx.

43 http://www.caiso.com/Documents/IssuePaper-CAISO-CPUCStorageWorkshopMay2-32016.pdf.

station power rules for energy storage resources. The CAISO and the CPUC recently held a joint workshop on this issue.[44]

Dated: May 16, 2016

Respectfully submitted,

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[44] *Id*.

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the captioned proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated in Folsom, California this 16th day of May, 2016.

/s/ Anna Pascuzzo
Anna Pascuzzo