

**UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION**

California Independent System                    )  
Operator Corporation                                )     Docket No. ER16-1085

**INFORMATIONAL REPORT OF THE  
CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION**

Consistent with the Commission’s directive, the California Independent System Operator Corporation (CAISO) submits this informational report on implementation efforts associated with its distributed energy resource provider tariff rules.<sup>1</sup>

**I. Background and Scope of Report**

In March 2016, the CAISO filed tariff revisions to facilitate participation of aggregations of distribution connected or “distributed” energy resources in its wholesale markets.<sup>2</sup> These tariff revisions establish an initial framework to enable aggregations of energy resources connected to distribution systems within the CAISO’s balancing authority area to participate in the CAISO’s energy and ancillary services markets. The Commission accepted the CAISO’s tariff revisions, subject to condition. The Commission also directed the CAISO submit this informational report.

The CAISO’s framework recognizes distributed energy resource aggregations as a new type of market resource similar to a generating facility. The proposed framework also recognizes a distributed energy resource provider as the owner or operator of the aggregation. The distributed energy resource

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<sup>1</sup> *Cal. Indep. Sys. Operator Corp*, 155 FERC ¶ 61,229 (2016) at P 45.

<sup>2</sup> CAISO tariff amendment in Commission Docket ER16-1085 filed March 3, 2016. <http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14163686>

provider can elect to contract with or become a scheduling coordinator itself in order to participate in the CAISO markets. Working through its scheduling coordinator, the distributed energy resource provider will disaggregate CAISO dispatch instructions to the individual distributed energy resources that comprise the aggregation to comply with the CAISO's dispatch instructions. The distributed energy resource provider will also submit settlement quality meter data for its aggregation to the CAISO through its scheduling coordinator. The distributed energy resource provider will also need to interface with the utility distribution company or metered subsystem that operates the distribution system in the CAISO balancing authority area where resources in its aggregation are connected. The CAISO's tariff revisions recognize the need for coordination between the CAISO and distribution system operators.

As part of its order accepting the CAISO's tariff revisions, the Commission directed the CAISO to submit an informational report on implementation efforts six (6) months after the effective date of the proposed tariff revisions to include among other information:

- (1) Information regarding the number of distributed energy resource aggregations that have requested to participate in the CAISO markets;
- (2) The status of those requests and issues identified by utility distribution companies or metered subsystems;
- (3) The progress of aggregations through CAISO's new resource implementation process;
- (4) The status of changes to business practice manuals and operating procedures to implement CAISO's proposed framework; and

- (5) A discussion of any additional issues involving coordination between transmission and distribution service providers arising from coordinated efforts to implement CAISO's proposed framework.<sup>3</sup>

Based on concerns expressed by Pacific Gas and Electric Company, the Commission also directed the CAISO to include a discussion of whether the thirty (30) day review period is sufficient for the utility distribution company or metered subsystem to assess whether an aggregation meets the relevant tariff requirements for participation and does not pose a threat to the safe and reliable operation of the distribution system.<sup>4</sup>

Since the issuance of the Commission's order, the CAISO and interested stakeholders have worked to implement the framework for distributed energy resources aggregations to participate in the CAISO's markets. The CAISO has revised business practice rules, created a participation guide, and developed a website for prospective distributed energy resource providers. As reflected in this report, the three large investor owned utility distribution companies operating within the CAISO's balancing authority area are working collaboratively with the CAISO to explore necessary procedures and information sharing to support operation of distributed energy resource aggregations in a safe and reliable manner.

## **II. The CAISO has received requests by entities seeking to operate distributed energy resource aggregations**

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<sup>3</sup> *Id.* at P 45.

<sup>4</sup> *Id.* As described in Section III of this informational report, the CAISO has received preliminary comments from UDC/MSS staff concerning this issue. The CAISO expects additional feedback as UDC/MSS operators gain actual experience with the 30 day review period.

As part of its tariff revisions to implement its distributed energy resource provider initiative, the CAISO included a *pro forma* agreement to recognize distributed energy resource providers as CAISO market participants, similar to participating generators.<sup>5</sup> To initiate the execution of a *pro forma* distributed energy resource provider agreement, a prospective distributed energy resource provider completes and submits to the CAISO an information request sheet. The prospective distributed energy resource provider and the CAISO execute the agreement prior to undertaking subsequent steps to establish a distributed energy resource aggregation as a market resource. As with other CAISO participating agreements, the agreement binds the distributed energy resource provider to the terms of the CAISO tariff. The agreement also requires that the distributed energy resource provider satisfy all applicable rules and regulations of the utility distribution company (UDC) / metered subsystem (MSS) as well as requirements of the applicable local regulatory authority (LRA). The agreement requires that the provider use a certified scheduling coordinator for all required CAISO tariff activities including the submission of settlement quality meter data.

To date, four entities have executed agreements with the CAISO to become distributed energy resource providers: Apparent Energy, Inc. (Apparent Energy); Galt Power, Inc. (Galt), Olivine, Inc. (Olivine), and San Diego Gas & Electric Company (SDG&E).

Apparent Energy<sup>6</sup> executed its agreement on June 13, 2016. Apparent Energy has proposed two aggregations within the utility distribution territory of

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<sup>5</sup> See Appendix B.21 of the CAISO tariff.

<sup>6</sup> Apparent Energy has authorized the CAISO to describe its proposed aggregation projects in this report.

Pacific Gas and Electric Company (PG&E) as well as the MSS boundaries of City of Santa Clara doing business as Silicon Valley Power and the City of Palo Alto. Apparent Energy plans to locate these aggregations in the South Bay sub-load aggregation point (sub-LAP)<sup>7</sup> and in the San Francisco Peninsula sub-LAP. Each aggregation would comprise 1-1.5 MW, incorporating Apparent Energy's intelligent grid operating system to coordinate operations. Apparent Energy is coordinating with PG&E as well as with both with Silicon Valley Power and City of Palo Alto to ensure they can coordinate operations within the sub-LAP boundaries. Apparent Energy is targeting Q1 2017 for commercial operation date of its distributed energy resource aggregations.

Galt Power<sup>8</sup> executed a Distributed Energy Resource Provider Agreement with the CAISO on November 8, 2016. Galt Power is a registered market participant in all of the North American organized wholesale markets and contracts with Customized Energy Solutions, LTD. (CES), which manages over 6,000 MW of resources across the United States and provides scheduling coordinator services in California. CES has informed the CAISO that it is in discussions with several entities seeking to aggregate renewables and small scale storage.

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<sup>7</sup> A sub-LAP is a CAISO defined subset of pricing nodes within a default load aggregation point (default LAP). See Appendix A to CAISO tariff, Master Definitions and Supplement. Sub-LAPs were initially developed with the advent of congestion revenue rights to reflect major transmission constraints within each utility service territory (*i.e.*, within a default LAP).

<sup>8</sup> Galt Power has authorized the CAISO to describe its proposed aggregation projects in this report.

Olivine<sup>9</sup> executed a distributed energy resource provider agreement with the CAISO on November 22, 2016. Olivine is working with a number of clients, including municipalities, community choice aggregators, and resource owners who plan to deploy resources as part of distributed energy resource aggregations in the future. Olivine has informed the CAISO that it is working with several entities in the planning and development of advanced energy communities, and as a part of the planning process is considering the addition of distributed energy resources and the potential conversion of storage and electric vehicle assets currently participating as demand response resources.

The CAISO and SDG&E executed a distributed energy resource provider agreement on November 11, 2016.<sup>10</sup> SDG&E anticipates establishing an aggregation that participates in the CAISO's markets by 2018. As currently envisioned, the aggregation would involve energy storage systems across five separate sites in the northern, northeastern, and central portions of SDG&E's service territory. The aggregation would be distributed across five different CAISO pricing nodes in the SDG1 sub-LAP and provide 3-4 MW of capacity.

The CAISO welcomes the active participation of these entities, as well as others, in helping to implement the framework to facilitate wholesale market participation by aggregations of distributed energy resources. The CAISO expects that the projects identified above and other new aggregation projects will result in all parties developing valuable operating experience, including, but not limited to, an understanding of practical barriers to, and potential benefits of,

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<sup>9</sup> Olivine has authorized the CAISO to describe its proposed aggregation projects in this report.

<sup>10</sup> SDG&E has authorized the CAISO to describe its proposed aggregation project in this report.

distributed energy resources. These projects will also provide experience with the CAISO's distributed energy resource aggregation process to UDC/MSS operators and the distributed energy resource providers. This experience may result in proposed enhancements and refinements to the initial market rules accepted by the Commission.

### **III. Discussions between prospective distributed energy resource providers and UDC/MSS are ongoing**

Since the adoption of the CAISO's tariff provisions, the CAISO has developed a website devoted to the implementation of the distributed energy resource provider initiative.<sup>11</sup> This website contains an overview of process requirements, forms to facilitate new aggregations of distributed energy resources and contact information. The CAISO has also posted a participation guide and checklist to assist prospective distributed energy resource providers.<sup>12</sup> The website explains the CAISO's new resource implementation process and provides a dedicated customer support contact.

As part of initiating a new distributed energy resource aggregation, a distributed energy resource provider must download a UDC/MSS concurrence letter template. This letter template is available on the CAISO's website. The distributed energy resource provider must then submit the concurrence letter template and Attachment A of the letter to the UDC or MSS to provide these

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<sup>11</sup> See CAISO Distributed Energy Resource Provider website:  
<http://www.aiso.com/participate/Pages/DistributedEnergyResourceProvider/Default.aspx>

<sup>12</sup> See Distributed Energy Resource Provider Participation Guide and Checklist:  
<http://www.aiso.com/Documents/DistributedEnergyResourceProviderParticipationGuideandChecklist.pdf>

entities an opportunity to review the distributed energy resources for accuracy of the information listed in the Attachment A or raise concerns or comments.<sup>13</sup>

Under the CAISO tariff, the UDC or MSS has 30 calendar days to disclose any concerns. At the end of the 30 calendar day period, or earlier if the UDC or MSS have completed their review, the distributed energy resource provider must obtain written confirmation of any concerns raised by the UDC or MSS. If there are no concerns, the distributed energy resource provider must obtain written confirmation from the UDC or MSS before it may proceed to the CAISO's new resource implementation process by completing the project details form and submitting it and the UDC/MSS concurrence letter to the following email address: [NewResourceImplementation@caiso.com](mailto:NewResourceImplementation@caiso.com).<sup>14</sup>

To date, the CAISO has not received a UDC/MSS concurrence letter within the new Resource implementation process. The CAISO encourages prospective distributed energy resource providers to confer with the applicable UDC/MSS prior to requesting that they complete the concurrence letter. The CAISO understands that this coordination is occurring in connection with the proposed projects identified in Section II of this informational report. Notwithstanding this coordination, the CAISO has received comments from UDC/MSS staff that their internal processes to review a proposed aggregation may take longer than 30 days to complete. For example, the CAISO is informed that UDC/MSS internal process requirements to assess whether an aggregation may threaten the safe

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<sup>13</sup> Once submitted to the CAISO, the UDC/MSS concurrence letter serves to identify the distributed energy resources that will comprise the aggregation as reflected on Schedule 1 of the distributed energy resource provider agreement.

<sup>14</sup> See *generally* Business Practice Manual for Generator Management, Section 3.5. [https://bpmcm.caiso.com/BPM%20Document%20Library/Generator%20Management/BPM\\_for\\_GeneratorManagement\\_V17\\_clean.docx](https://bpmcm.caiso.com/BPM%20Document%20Library/Generator%20Management/BPM_for_GeneratorManagement_V17_clean.docx)

and reliable operation of the distribution system or to authorize release of customer information may take longer than the 30 days period provided for the return of a concurrence letter. The CAISO will continue to work with relevant staff at UDC/MSS to explore these concerns and will encourage prospective distributed energy resource providers to confer with UDC/MSSs early in the process of developing their aggregations.

**IV. Distributed energy resource aggregations have not yet entered the CAISO's new resource implementation process**

As explained in Section III, before beginning the CAISO new resource implementation process, a distributed energy resource provider must obtain concurrence from the applicable UDC or MSS that they have not identified concerns about the distributed energy resources comprising a distributed energy resource aggregation. To date, the CAISO has yet to undertake a new resource implementation process with a distributed energy resource aggregation.

To accommodate distributed energy resource aggregations in the current new resource implementation process, the CAISO has updated its process to define applicable requirements. As an example, the CAISO revised its new resource implementation checklist to identify only those documents that are relevant for a distributed energy resource provider to submit to the CAISO. Additionally, the CAISO is working to update its new resource implementation guide to explain the pathway to implement a distributed energy resource aggregation as a new wholesale resource.

**V. The CAISO has made initial changes to its business practice manuals and is exploring changes to its operating procedures**

Earlier this year, the CAISO undertook a process to update its business practice manuals to reflect the tariff revisions submitted for Commission approval

in this proceeding. As part of this effort, the CAISO made changes to its business practice manual for metering to specify metering requirements for a distributed energy resource device if no LRA metering requirement exists.<sup>15</sup> The CAISO modified its business practice manual for metering to add data validation, estimation, and editing requirement for these distributed energy resources.<sup>16</sup> The CAISO also added Section 3.5 to its business practice manual for generator management to explain the process to onboard distributed energy resource aggregations as CAISO wholesale market resources.<sup>17</sup> As explained in Section VI, the CAISO is currently undertaking an inquiry to identify necessary changes to its operating procedures with a focus on information sharing between the CAISO and UDC/MSS operators to facilitate safe and reliable operation of distributed energy resource aggregations.

**VI. The CAISO and utility distribution companies are actively developing protocols to support operation of distributed energy resource aggregations**

The CAISO controlled transmission grid serves to provide bulk electric power delivery from utility-scale generation facilities to electric substations via interconnected high-voltage power lines. Some of these electric substations in turn connect to distribution systems which in turn deliver the power to end-use customers via electric distribution lines. The “transmission-distribution interface”

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<sup>15</sup> See Attachment G to Business Practice Manual for Metering: Technical Metering Specification for Distributed Energy Resource Devices (if no LRA standards exist) [https://bpmcm.caiso.com/BPM%20Document%20Library/Metering/BPM%20for%20Metering\\_v15\\_Clean.docx](https://bpmcm.caiso.com/BPM%20Document%20Library/Metering/BPM%20for%20Metering_v15_Clean.docx)

<sup>16</sup> Attachment H Business Practice Manual for Metering: Data Validation, Estimation and Editing (VEE) for Distributed Energy Resource Devices. [https://bpmcm.caiso.com/BPM%20Document%20Library/Metering/BPM%20for%20Metering\\_v15\\_Clean.docx](https://bpmcm.caiso.com/BPM%20Document%20Library/Metering/BPM%20for%20Metering_v15_Clean.docx)

<sup>17</sup> See fn 14, *supra*.

is at these points where the transmission and distribution grids interconnect. Historically, electric power at this interface flowed only in one direction—from transmission to distribution. But where distributed energy resources can inject electric power onto the distribution grid, this flow may reverse.

The participation of distributed energy resource aggregations in the CAISO wholesale market will utilize or depend on the capabilities of the transmission and distribution systems, and will have an impact on both systems. This participation will also impact both the transmission and distribution systems. Although these two systems interconnect and form the overall electric grid, they are two distinct systems with inherently different structures, characteristics and functions. Despite aggregations of distributed energy resources depending on both of these systems to participate in the CAISO wholesale market, today there is limited communication and coordination between transmission and distribution system operators.

In anticipation of distributed energy resource aggregations participating in the CAISO wholesale market beginning in 2017, in early 2016 the CAISO began working with several UDCs in the CAISO balancing authority area to identify and develop protocols to support the operation of aggregations in CAISO wholesale markets. The purpose of this effort is to outline the unique challenges that the participation of these distributed energy resource aggregations in CAISO wholesale markets may pose, including the operational coordination needed at the transmission-distribution interface, the specific enhancements required to address the operational needs, and a clear understanding of the respective roles and responsibilities of the UDC and CAISO at the transmission-distribution interface.

The CAISO and UDCs have started this effort by mapping the communications and operational arrangements that exist today between the CAISO, utility transmission operators, utility distribution operators, transmission-connected generation, distributed energy resources, and scheduling coordinators, among others. This mapping effort established that today the CAISO and UDC operators do not generally exchange information or coordinate activities for normal real-time operations. Absent any enhanced coordination or new sharing of information, participation in the CAISO wholesale markets by distributed energy resource aggregations may result in each of these entities missing some information they may require to meet their respective responsibilities or objectives.

The near-term focus of this effort will identify enhancements needed in 2017 when the level of distributed energy resource aggregations participation in the CAISO wholesale market is anticipated to be relatively low. Through this effort, the CAISO hopes to develop preliminary findings and recommendations by the end of 2016. The CAISO plans to share these findings and recommendations with all interested parties and solicit feedback. These findings and recommendations will inform changes to CAISO operating procedures to support distributed energy resource aggregations.

## **VII. Conclusion**

The CAISO is in the process of implementing the distributed energy resource provider framework accepted by the Commission. The CAISO has updated onboarding procedures and documents and is working with UDCs to identify how best to address the safe and reliable operation of distributed energy resource aggregations. Although there is a considerable work ahead, initial aggregations of distributed energy resources will help all interested parties *learn*

*by doing*. Once aggregations are operational, the CAISO also plans to sample meter data from an aggregation to validate whether the aggregation is responding to CAISO dispatch instructions consistent with its distribution factors. The CAISO will make its findings available to the public. With additional experience, the CAISO will explore changes to the distributed energy resource provider framework, as necessary, through its stakeholder initiative processes.

Respectfully submitted,

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**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 proceeding, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, CA this 30<sup>th</sup> day of November, 2016.

*Anna Pascuzzo*

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