UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Review of Generator Interconnection Agreements and Procedures	)	**Docket No. RM16-12-000**
American Wind Energy Association	)	**Docket No. RM15-21-000**

PREPARED STATEMENT OF STEPHEN RUTTY ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

My name is Stephen Rutty. I have worked at the California Independent System Operator Corporation ("CAISO") for 16 years, and currently serve as the Director of Grid Assets. In this position, I oversee the CAISO's interconnection process and participate in the CAISO's stakeholder initiatives involving interconnection procedures as well as the development of interconnection tariff rules filed at the Commission.[1] Before joining the CAISO, I was a transmission engineer at the Los Angeles Department of Water and Power for 16 years. I am registered in California as a Professional Engineer in electrical engineering.

The CAISO appreciates the opportunity to participate in this proceeding and in this technical conference. The CAISO and its stakeholders have benefited from the regional flexibility the Commission has provided us in tailoring our interconnection

[1] *See American Wind Energy Association,* CAISO Comments, Docket No. RM15-21-000, pp. 6-9 (detailing each of the CAISO's queue reforms). http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13981405

procedures to meet our needs. The CAISO encourages FERC to maintain this regional flexibility in the continued development of interconnection procedures.

Since 2008, when the CAISO moved to a cluster study approach, the CAISO has processed and studied approximately 800 projects comprising over 120,000 MW. The CAISO has just closed its latest interconnection queue cluster request window (Cluster 9). In this latest request window, we received over 125 interconnection requests for approximately 25,000 MW of new resource capacity.

Under the regional flexibility afforded by the Commission, the CAISO has worked closely with its stakeholder community to develop a generation interconnection process that accomplishes the following:

- allows the CAISO to process and study hundreds of interconnection requests annually;
- aligns the CAISO's interconnection process with its transmission planning process to develop appropriate transmission to meet reliability, economic and policy needs;
- aligns with the transmission owners' distribution generation interconnection ("WDAT") processes;
- provides interconnection customers with fixed and anticipated annual study schedules; and
- provides cost certainty for network upgrades very early in the study process.

The CAISO continuously works with stakeholders to identify enhancements to our interconnection procedures. While the CAISO believes its interconnection processes are working well to meet stakeholders needs, it may not be well-suited to

other regions, and vice versa. The CAISO respectfully requests that the Commission continue to ensure that each region maintains the flexibility to adopt the interconnection procedures that serve the needs of that particular region.

I. TRANSPARENCY AND TIMING IN THE GENERATOR INTERCONNECTION STUDY PROCESS

1. The length of time it takes to complete the interconnection process, causes of variances in receiving study results, causes of variations in length of time in the queue, and how delays (and their causes) are reported to interconnection customers.

The queue cluster process at the CAISO takes approximately two years to complete interconnection studies. There are faster options for qualified projects that are independent and have demonstrated a viable need to move forward at a faster pace.

Because the study process is fully integrated with the CAISO's annual transmission planning process, it is critical to complete the study processes on schedule, and so far the CAISO and transmission owners have met this schedule. At present, we do not have any study process backlog.

The CAISO tariff requires the CAISO and transmission owners to meet interconnection study deadlines. These deadlines provide a reasonable time for interconnection customers to review study results and make decisions on whether to move forward with projects as well as participate in load serving entities' requests for offers to secure power purchase agreements. There is a balance between providing an interconnection customer with sufficient information to make critical decisions to move forward and the overall time to complete the interconnection study process.

2. *How study costs are determined, how consistent these costs are between markets and regions, whether (and how) interconnection customers are made aware of study costs in advance of requesting interconnection service.*

The CAISO has processed cluster studies (8 clusters) since 2008 and has adjusted study deposits to match reality and create certainty for stakeholders. Most recently, the CAISO filed tariff revisions with the Commission to reset the study deposit to $150,000—regardless of project size or location. This study deposit is designed to cover the entire study process costs (Phase 1 and 2 and any reassessment studies) for most projects, and was based on a detailed review of actual cost history. The interconnection customer ultimately pays for all actual study costs. Study costs are also shared between cluster participants, which adds to cost efficiency and avoids large disparities in study costs between participants.

3. *The information (models, assumptions, cost estimates, etc.) to which interconnection customers currently have access and the stage in the interconnection process when such access is provided (pre-request, study stage, etc.). Whether additional information (historical and/or projected curtailment or pricing information, etc.) should be available to interconnection customers to assist them in planning projects, and the challenges and/or barriers to providing this information.*

The CAISO posts all base cases (models used to assess network upgrades during the interconnection study process) at the beginning of each cluster study as soon as they are available. These models are available to market participants with a non-disclosure agreement.

Annually, the CAISO posts updated per unit costs for typical transmission facilities, which are used for estimating costs in the study process. These per unit costs are provided by the transmission owners and vetted with stakeholders in an annual

CAISO open stakeholder meeting. These per unit costs are available to any interested party on our website.

Capped cost estimates for network upgrades are provided to each interconnection customer for their specific project at the end of the Phase 1 study, approximately eight months after the queue cluster window closes. Estimates for transmission owner interconnection facilities also are provided at this time but are not capped. These cost estimates are based on the publicly available per unit costs.

In addition, the CAISO's annual Transmission Plan discusses forecast congestion through an economically-driven transmission analysis.

4. How the capacity factor used for variable generation modeling is determined (in general terms) and shared with interconnection customers.

The CAISO does not operate a centralized forward capacity market. Instead, the CAISO's tariff includes resource adequacy rules developed in coordination with stakeholders and local regulatory authorities. Capacity factors of different technologies are incorporated into the CAISO deliverability study that determines the need for delivery network upgrades to support ensuring that resources seeking to interconnect may qualify as resource adequacy resources. The CAISO developed the methodology to test deliverability of qualifying capacity consistent with resource adequacy counting rules. For wind and solar resources, the assessed capacity is based on the historical output exceedance level during the summer peak hours, which is lower than the installed capacity and close to the qualifying capacity used for resource adequacy purposes.

5. The triggers for restudy, how they are determined, and whether they are stated in the tariff. The possible effect that limiting the number of restudies would have on reliability or cost estimates, allocations, or assignments.

The CAISO has a two-phase study process followed by annual reassessment studies for all active projects to take into account all withdrawals and downsized projects. The CAISO and its stakeholders designed this process to reduce or eliminate the need for restudies, which it largely has. In most cases, interconnection customers affected by the reassessment will have network upgrades removed from their cost responsibility because the network upgrades are deemed no longer necessary. In any case, customers are always protected by their cost cap (maximum cost responsibility) if costs do go up. The relevant transmission owner is responsible for costs that exceed the interconnection customer's cost cap.

II. CERTAINTY IN COST ESTIMATES AND CONSTRUCTION TIME

1. The manner in which disputes regarding interconnection configurations or direct assignment and network upgrade costs are typically resolved and how such disputes could be avoided. The frequency of such disputes.

The CAISO holds results meetings with the interconnection customer and the relevant transmission owner to discuss study results. At these meetings, concerns about the study results are discussed and a majority of them are resolved quickly. Because of the transparency of the process—public base cases and cost guides—rarely are there any disputes, but the CAISO does have a dispute resolution process if the need arises.

2. *When cost and construction schedule estimates are provided to interconnection customers and the accuracy of these estimates compared to actual results. Whether early cost estimates are sufficient to allow customers to make decisions whether to move forward with a project. The process changes necessary to provide more accurate estimates earlier to interconnection customers.*

The CAISO provides cost and construction estimates to interconnection customers at the end of the phase 1 cluster study, approximately 8 months after the close of the interconnection cluster study window. The cost estimates are based on per unit costs that are made public annually by each transmission owner and posted on the CAISO website. These initial costs in the phase 1 study provide a cap for maximum cost responsibility the interconnection customer will face.

If the interconnection customer choses to continue, approximately a year later the CAISO and relevant transmission owner complete the phase 2 studies. These studies are much more detailed and may have a different cost estimate for network upgrades. If the costs are lower than the phase 1 study, the interconnection customer receives the lower cost as their cap or maximum cost responsibility. If the cost is higher, the phase 1 cap will still stand and the relevant transmission owner will be responsible for the difference.

3. *The factors that affect accuracy of cost and schedule estimates and how estimate variances can be reduced.*

Making per unit costs transparent has added a consistency to the CAISO's study report estimates. In addition, providing cost caps on network upgrades has provided the interconnection customers with certainty early in the study process.

4. How other queued facilities that may impact an interconnection customer's request are identified and when interconnection customers are made aware of such facilities (e.g., a lower-queued project being informed that the withdrawal of a specific higher-queued project may affect it). The challenges of identifying those facilities that may impact an interconnection request.

By implementing a cluster study approach and providing cost caps to interconnection customers early in the process, the CAISO protects lower queued projects from higher queued projects that withdraw. This approach eliminates cascading restudies and cost shifting to lower queued projects.[2]

III. INTERCONNECTION OF ELECTRIC STORAGE RESOURCES

1. Whether existing small and large pro forma interconnection agreements and procedures are sufficient to accommodate the interconnection of electric storage resources.

The CAISO held a stakeholder process to discuss this very issue.[3] In collaboration with its stakeholders, including energy storage interests, the CAISO determined that the current interconnection process can accommodate the interconnection of electric storage resources. The CAISO will continue to work with stakeholders to examine possible enhancements to facilitate the interconnection of electric storage resources.

[2] Generally, the CAISO only has needed to restudy historic serial customers (pre-2008) that have lingered in queue such that their original study results have become stale.

[3] More information about the CAISO's stakeholder process is available at the following website: https://www.caiso.com/informed/Pages/StakeholderProcesses/EnergyStorageInterconnection.aspx.

2. Modeling of electric storage resources for interconnection studies, including potential means for interconnection studies to better reflect the intended operation of electric storage devices.

To date, electric storage interconnection customers have provided effective models for the study process. The only change the CAISO and transmission owners have made is to look at the charging (or "negative generation") aspect of the storage device to ensure system reliability during both resource charging and discharging. We look for congestion or other reliability constraints during peak and non-peak conditions.

3. *Interconnection of combined storage and generation facilities, including (i) the appropriate level of interconnection service for the combined facility; (ii) the operational understanding, telemetry, and metering of the combined facility; and (iii) the appropriate interconnection process for adding storage to an existing generation facility.*

This has been an intriguing issue, but the CAISO has been able to work through these issues with the storage and stakeholder community.

(i) We apply an appropriate exceedance value to the facility based on its configuration so that we do not overbuild the transmission system. Energy storage devices must be able to provide a constant discharge rate for 4 hours to be considered for resource adequacy capacity.

(ii) Metering is fairly flexible based on the combined facility's needs, especially if there is a need to meter the storage separately to meet regulatory or contractual requirements.

(iii) The CAISO uses the existing available interconnection processes to accommodate the addition of storage to existing facilities when it is determined that the storage will change the characteristics or increase the output of the original plant. There are non-material avenues to add storage to an existing resource or proposed project if the storage does not substantially change the characteristics of the original plant, including the repowering process.

4. Potential processes to facilitate the interconnection of electric storage resources.

The CAISO and stakeholders have not identified any better process to facilitate the interconnection of storage resources than the existing interconnection processes. The CAISO currently has over 75 interconnection requests for over 8,700 MW of electric storage. The CAISO's transmission owners have numerous requests on their distribution networks as well.

5. Interconnection of distribution-level and aggregated electric storage resources that participate in the RTO and ISO markets.

The CAISO's interconnection process can accommodate deliverability studies for distribution-connected resources, including electric storage resources. In addition, CAISO transmission owners have developed their WDAT interconnection processes to align with the CAISO's interconnection process.