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Discussion Document: Integrating Renewables in the CAISO market Near-Term Market Design Options for Consideration

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CONTEXT: For decades, the California and the Northwest power systems have relied on the diversity of resources and loads to cost-effectively support each other's system needs. Although the resources, loads and markets have evolved over time, the opportunity to support each other continues to exist today.

The addition of renewable generation across the Western Interconnection has changed the level of flexibility that our power system requires. The CAISO market is evolving to meet these changing needs with the creation of the Energy Imbalance Market, the Flexible Resource Adequacy products, the Flexible-Ramping Product and consideration of a Regional ISO. Integration of new renewables across the West will continue. The CAISO market must continue to evolve to ensure a market design that sends sufficient price signals to incent the resource characteristics needed to cost-effectively and reliably meet the needs of the system.

PURPOSE: Identify options that can be implemented in the near-term to enhance CAISO market design to take better advantage of the import and export opportunities between the Northwest and California.

PRINCIPLES:

- Ensure market rules provide a level playing field for all resources:
 - Inside and outside of CAISO market footprint
 - New and existing resources
- Define flexibility needs on a forward basis to support product differentiation consistent with market dispatch:
 - Hourly shaped deliveries
 - 15-minute and 5-minute standby resources
- Provide forward commitment creating compensation to ensure availability and access to flexibility from resources that are external to the CAISO footprint
- Eliminate any unnecessary barriers to participation

NEAR-TERM OPTIONS FOR CONSIDERATION

- A. Flexible Resource Adequacy – Enhance the current Flexible Resource Adequacy Capacity procurement process by separating capacity requirements into the forecasted net load ramp and within-hour uncertainty and variability. Shaped hourly schedules (including exchanges) would qualify to meet forecasted net load ramp.
 - *For more detail, please refer to the attached Concept Paper*
- B. Flexible Ramping Product – Add a day-ahead Flexible Ramping Product to ensure that sufficient flexible capacity is set aside in the day-ahead time frame to be available during real-time operations. This will ensure that resources with ramping flexibility are available in the real-time markets to help meet 15-minute and 5-minute within-hour uncertainty.

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An Approach to Flexible Capacity in the CAISO Market

Concept Paper

This concept is based on discussions with Bonneville Power Administration, Powerex, and Public Power Council

Proposed Modifications to Flexible Resource Adequacy Requirements

I. Modify the definition of flexible resource adequacy needs

Separate the total flexible capacity requirements into the amount that can be forecasted ahead of time (forecasted net load ramp) and the portion that is not known until real-time (within-hour uncertainty and variability).

a. Define and evaluate forecasted net load ramping requirements

- A substantial portion of the daily max 3-hour net load ramp is known ahead of time, even at the time of the annual and/or monthly resource adequacy showings, because it is the result of predictable changes in load and solar production.
- These forecasted changes can be met through forward commitments for energy deliveries shaped to offset the forecasted ramp and do not require within-hour dispatchability.

b. Define and evaluate within-hour variability and uncertainty

- Within-hour variability and uncertainty encompasses changes in load and resource output that are partially predictable in advance of each hour and partially not predictable in advance.
- To assure system reliability, the CAISO must continuously be prepared to meet unpredictable within-hour changes whether or not they materialize.
- Meeting these within-hour changes require resources on standby that have relatively high ramp rates and that are dispatchable on short lead times.

II. Align resource requirements with the modified flexible resource adequacy definitions

- With a more detailed definition of the flexible resource adequacy needs, specific resource characteristics can be defined.
- It is expected that the portion of the 3-hour net load ramp that is forecastable could be reduced on a forward basis with any resource or contract that is deliverable in a shaped hourly schedule.
- The within-hour requirements could be translated into specific amounts of 15-minute market and 5-minute standby resources, with ramp rates being used to determine the amount of each product that the resource is qualified to provide.
- The specific resource requirements may not necessarily be as stated above, but should be aligned with a more refined definition of flexible resource adequacy needs and the resource characteristics needed to meet them.

III. Match flexible resource adequacy products to market dispatch intervals

- The CAISO currently dispatches resources on an hourly, 15-minute, 5-minute, and 4 second basis.
- Matching flexible resource adequacy products to these dispatch intervals ensures the right quality of resources needed to support flexibility needs and should result in the least costly solution to meeting flexible resource adequacy requirements.

Benefits of this Approach

Provides Greater Ability for NW Hydro to Offer Flexibility

- Product differentiation that provides a forward commitment increases CAISO's access to the flexibility of PNW hydro systems since a hydroelectric system's flexibility is greater the farther ahead of real-time operations that the obligation is established.
 - Flexible Resource Adequacy: Procuring shaped energy schedules and standby flexibility on a year-ahead and month-ahead basis under the Flexible Resource Adequacy program will enable PNW systems to provide a greater contribution towards California's flexibility challenges.
 - Flexible Ramping Product: Extending the Flexible Ramping Product to the day-ahead time frame will help ensure that flexible capacity is set-aside, including on PNW hydro systems, to be available for real-time operations.
- Product differentiation would eliminate transmission limits on level of PNW participation:
 - The current 5-minute dispatch qualification criterion requires the use of dynamic transfer capability to be delivered and thereby limits any potential participation over the Pacific Northwest-Pacific Southwest intertie to amounts within the intertie's 400 MW dynamic transfer capability limit.
 - Product differentiation would define a portion of Flexible Resource Adequacy to be met with 15-minute standby resources, which would make available the use of the entire California-Oregon intertie capacity for potential Flexible Resource Adequacy, totaling approximately 3,200 MW when all lines are in service.
 - Further, enabling the use of hourly shaped schedules to meet forecasted net load ramp adds up to another 3,000 MW of potential Flexible Resource Adequacy that could be delivered on the Nevada-Oregon DC intertie (which currently does not support intra-hour scheduling).

Assures Access to the Flexibility that is Needed

- As CAISO indicated in its assessment of flexible capacity, the current qualification criteria do not ensure procurement of resources that adequately meet the ISO BAA needs.
- Separately defining and meeting a portion of the flexible capacity requirements on a forward-looking basis effectively deploys the capabilities of long-lead time resources, slower ramping resources, and intertie resources.
- Aligning the remaining flexible capacity product definitions with the market dispatch intervals:
 - Ensures that resources with the necessary ramp rates and dispatchability attributes are available to the CAISO, and
 - Encourages efficient procurement of resources capable of meeting flexibility needs at the least cost, thereby reducing cost to consumers.

Appropriately incents procurement of needed resource characteristics

- Procurement of the appropriate quality of flexible capacity improves the ability to manage within-hour uncertainty and flexibility. These changes create the opportunity to reduce minimum generation requirements that lead to the curtailment of renewable resources, supports continued development of in-state renewable resources, and incents the development of new resources with the appropriate flexibility attributes.

- Enabling access to out-of-state flexible hydro resources provides a cost-effective, carbon free option to meet CAISO's flexible capacity needs, including as a bridge option while storage technologies are developed and deployed in-state.
- Separately defining and meeting a portion of the flexible capacity requirements on a forward-looking basis will also similarly enable participation of long-lead time resources and slower ramping resources.

Cost-Effective

- The current qualification criteria requiring the entire 3-hour net load ramp be met with 5-minute dispatchable standby resources is not necessary or cost effective.
- Further differentiating the within-hour uncertainty needs based on suitability to each market interval (hourly, 15-minute, 5-minute, or regulation) avoids having to procure the entire requirement through the most flexible "premium" standby resources.