BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local and Flexible Procurement Obligations for the 2019 and 2020 Compliance Years	Rulemaking 17-09-020 (Filed September 28, 2017)

OPENING COMMENTS OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

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I. Introduction

The California Independent System Operator Corporation (CAISO) hereby provides opening comments on the *Proposed Decision Adopting Local Capacity Obligations for 2020-2022, Adopting Flexible Capacity Obligations for 2020, and Refining the Resource Adequacy Program* (Proposed Decision), issued in this proceeding on May 24, 2019. The CAISO appreciates this opportunity to provide opening comments.

II. Discussion

The CAISO appreciates the Commission's efforts to establish local capacity requirement obligations for 2020-2022 and flexible capacity obligations for 2020. The obligations provided in the Proposed Decision are consistent with the CAISO's local and flexible requirement technical studies and the Commission should adopt the Proposed Decision's requirements without modification. The CAISO also appreciates the efforts of the Assigned Commissioner's office, Administrative Law Judges, and Energy Division staff for working with the CAISO to develop local and flexible requirements review processes that both provided the CAISO with the time to conduct the necessary studies and provided parties with adequate opportunity to review and comment on the studies. The CAISO also appreciates the Commission's recognition of the term "availability-limited resource" and commits to work closely with the Commission to ensure that resource availability needs are met in all local reliability areas.

In addition to adopting forward local and flexible capacity obligations and recognizing availability-limited resources, the Proposed Decision makes several refinements to the Commission's resource adequacy program. Most notably, the Proposed Decision adopts new Effective Load Carrying Capacity (ELCC) values for wind and solar resources. The CAISO has

serious reliability concerns regarding the ELCC methodology referenced in the Proposed Decision. The CAISO also provides a clarification to prior comments on the counting methodologies for hydro and other use-limited resources and requests consideration of ELCC for demand response. Each of these issues are discussed in more detail below.

A. Effective Load Carrying Capacity

The CAISO agrees with the Energy Division's efforts to accurately reflect the reliability benefits of wind and solar resources and to update the previously adopted transitional ELCC values. However, the CAISO has significant concerns regarding Energy Division's ELCC methodology adopted in the Proposed Decision. Energy Division's methodology is based on a reliability level that is lower than the industry standard and, as a result, puts the system at risk for under-procurement. To remedy this concern, the CAISO requests the Commission:

(1) Continue to validate the ELCC methodology in future resource adequacy proceedings to properly apply a 1-in-10 year loss of load expectation (LOLE) to calculate ELCC values;

(2) Clarify the Proposed Decision to explicitly note that the methodology used to derive monthly ELCC values will not be used to validate reliability;

(3) Commit to reexamining the diversity benefit allocated to solar or wind ELCC values;

(4) Ensure that actual storage dispatch aligns with expected storage performance; and

(5) Adopt the wind and solar ELCC values presented by Energy Division staff solely for use during the 2020 resource adequacy compliance year.

The CAISO discusses these recommendations in more detail in the following subsections.

1. The Commission should continue to validate the ELCC methodology in future resource adequacy proceedings to properly apply a 1-in-10 year LOLE to calculate ELCC values.

The CAISO is fundamentally concerned that the Energy Division's LOLE analysis for calculating ELCC values is improperly based on a 3-in-10 year LOLE. This standard may improperly reduce reliability. As background, in the Integrated Resource Planning (IRP) proceeding, it is clear that a 0.1 peak day per year LOLE on an annual basis (*i.e.*, a 1-in-10 year LOLE) is the "industry standard target" that the Commission will use to "verify satisfaction of

the Planning Reserve Margin (PRM) requirement."[1] The ELCC methodology adopted in the Proposed Decision also begins with that assumption, before diverging from the industry standard in an effort to calculate monthly ELCC values.

As such, the CAISO reiterates comments previously submitted in the IRP proceeding that highlighted the CAISO's concern with Energy Division's methodology for adapting the ELCC study to develop monthly ELCC values:

> The CAISO is deeply concerned that Energy Division staff's methodology decreases the system reliability target from a 1-day-in-10 years loss of load expectation (*i.e.*, 0.1 LOLE) to a 3 days-in-10 years LOLE (*i.e.*, 0.3 LOLE)…[2]

The September 24 IRP Ruling describes in a footnote:

> Specifically, the monthly LOLE target was created by first taking the industry **standard 0.1 LOLE annual target and assuming that most of those events map to the four peak months of June through September,** or one third of the year. *Assuming a similar target reliability for the rest of the year would mean that total LOLE over the entire year should have a target of 0.1x3=0.3* **[emphasis added]**. Thus, monthly LOLE studies would have a monthly target LOLE of 0.3/12=0.025, i.e. a target range of 0.02 to 0.03.[3]

In adopting these monthly LOLE targets, Energy Division observed that utilities historically focused LOLE concerns on the high load months. The CAISO notes that this focus on high load months occurred largely prior to the implementation of wholesale markets, significant independent generation resources, monthly resource adequacy procurement targets, and the expansion of availability-limited resources. Planning to meet an LOLE target only during high load periods made sense in systems with highly dispatchable generation, essentially available year-round, with few, if any, use limitations. In that case, the capacity to meet peak load needs provided more than ample capacity margins in the non-peak months to serve load with very little risk of loss of load added on an overall annual basis.

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[1] *Administrative Law Judge's Ruling Seeking Comment on Production Cost Modeling* (September 24, 2019), in the Integrated Resource Planning Proceeding No. R.16-02-007, p. A-6 (September 24 IRP Ruling).
[2] CAISO Opening Comments to the September 24 IRP Ruling Seeking Comments on Production Cost Modeling (October 10, 2018), p. 5.
[3] September 24 IRP Ruling, p. A-7.

As noted in the CAISO's IRP comments, the North American Reliability Corporation (NERC) explains the methodological focus on peak hours as follows:

> The general principle is to start with a full year (or more) of data and calculate LOLE for each time period. During off-peak periods and times when there is excess generating capacity available, LOLE values will usually be zero. Non-zero LOLE values occur during peak periods and near-peak periods, and possibly during times that large amounts of capacity are undergoing scheduled maintenance and is therefore unable to provide capacity.[4]

This principle assumes that capacity resources are procured for an entire year and that those resources have few relevant use limitations, effectively producing near 0-in-10 LOLE values in the off-peak months.

Energy Division's ELCC methodology has not been adequately tested using different monthly baseline targets, so there is no comparative information to assess how sensitive the methodology is to different monthly targets that cumulatively meet a 1-in-10 year performance level.[5] The CAISO strongly encourages Energy Division to conduct additional analysis by testing (1) a monthly LOLE target equal to one-twelfth of the annual target LOLE and (2) a peak month cumulative LOLE target of 1-in-10 and off-peak months having a 0-in-10 LOLE. Without this analysis, it is unclear whether Energy Division's ELCC methodology inappropriately inflates the ELCC values and correspondingly degrades system reliability.

2. The Commission should clarify the Proposed Decision to explicitly note that the methodology used to derive monthly ELCC values will not be used to validate reliability.

The CAISO understands that Energy Division currently uses the LOLE criteria only to establish qualifying capacity values for wind and solar resources. The Commission uses the resulting qualifying capacity values to validate resource adequacy showings based on a deterministic load-plus-planning reserve margin metric. The Commission does not currently use

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[4] *Methods to Model and Calculate Capacity Contributions of Variable Generation for Resource Adequacy Planning to Ensure Reliability of the Bulk Power System,* NERC (March 2011), p. 10, available at: https://www.nerc.com/files/IVGTF1-2.pdf.

[5] *See Decision Adopting Local and Flexible Capacity Obligations for 2018 and Refining the Resource Adequacy Program,* Decision No. D.17-06-027 (June 29, 2017), Appendix A (2018 Decision). In the 2018 Decision, Appendix A notes that work by Calpine found the ELCC values for solar did in fact drop when using a 1-in-10 benchmark instead of 3-in-10. However, the CAISO notes that there are sufficient differences between the two models to warrant additional examination. 2018 Decision, p.A-1 to A-5.

the monthly LOLE criteria to directly establish or validate system resource adequacy requirements. The Commission should clarify the Proposed Decision to explicitly note that the adopted ELCC methodology will not be used to validate monthly capacity showings because the resulting 3-in-10 year LOLE criterion would degrade reliability if used to validate system resource adequacy showings or IRP processes.

The Commission should commit to reexamining the diversity benefit allocated to solar or wind ELCC values. Additionally, the Commission should modify the Proposed Decision to instruct Energy Division to further refine its methodology for calculating diversity benefits for solar, wind, and storage resources. The CAISO is concerned that Energy Division's methodology does not accurately reflect the true diversity benefit caused by various technology types within an overall portfolio. The CAISO recommends that Energy Division address this issue in more detail at the additional ELCC workshop directed by the Proposed Decision.

Energy Division's ELCC methodology attributes diversity benefits by comparing a combined wind, solar, and storage portfolio against standalone portfolios for each separate resource.[6] Although the CAISO agrees there are benefits to a diversified portfolio, the CAISO disagrees with Energy's Division's focus on only the diversity benefits of wind, solar, and storage. This methodology is flawed because the calculated diversity benefits of the entire fleet are arbitrarily attributed to wind and solar resource based on each resource's share of perfect capacity. The CAISO's concerns are the allocation of storage-attributed diversity benefits to solar resources based on the assumption that storage resources complement solar generation. As explained below, this assumption does not reflect actual operations.

In the next resource adequacy cycle, the Commission and Energy Division staff must work to answer fundamental questions about the diversity benefit calculation and allocation. These questions include whether diversity benefits are accurately defined as the difference between the standalone and portfolio perfect capacities and why resultant diversity "benefits" can be either negative or positive.[7]

[6] Step 3 from Administrative Law Judge Ruling on Effective Load Carrying Capacity, Attachment, *Energy Division Monthly ELCC Proposal for 2020 RA Proceeding* (February 13, 2019), p. 12.
[7] *Id.*

3. The Commission should ensure actual storage dispatch aligns with expected storage performance.

The CAISO supports continued improvements to align ELCC values with actual operational and market performance. Specifically, the Commission should work to ensure that modeling assumptions for storage resources mirror the short- and long-term operational capabilities of different storage technologies. More specifically, the Commission should ensure that the storage technologies operate as a complement to solar resources as expected in the ELCC studies without prematurely degrading the storage resource. The CAISO also supports diversifying the resource adequacy fleet to integrate renewables, which includes diverse storage technologies.

Energy Division's current production cost modeling assumes that storage resources complement solar production by charging during high solar production periods and discharging as solar production wanes in the evening hours. The CAISO agrees that an important operational benefit of storage is the ability to advantageously charge and discharge based on solar generation profiles. To capitalize on this potential benefit, storage resources may be required to follow multiple charge and discharge cycles (*i.e.*, cycling) every day, as confirmed by the Energy Division's own modeling simulations.[8] In reality, current contracting practices and prevailing battery technologies may not be well suited to provide the multiple and/or deep cycling capabilities required to address reliability and renewable integration needs. Continuous cycling may have a disproportionate impact on certain battery storage technologies leading to cell degradation and significant cost increases and equipment replacement.[9] The CAISO energy and ancillary services markets may not provide sufficient revenues to ensure cost recovery for the

[8] Proposed Decision, p. 45.

[9] For example, *see* discussion in the CAISO's Department of Market Monitoring's (DMM's) *2018 Annual Report on Market Issues and Performance*, p. 271 (DMM 2018 Annual Report), available at http://www.caiso.com/Documents/2018AnnualReportonMarketIssuesandPerformance.pdf:

> [C]urrent structures for modeling battery resources may not accurately reflect the ways in which operating a battery accelerates the need for the battery owner to incur significant, lumpy maintenance costs such as augmenting battery cells. For example, the depth of a battery's charge or discharge may significantly impact how often a battery resource requires cell augmentation. Stakeholders have explained that battery owners may agree to less expensive tolling contracts with developers if the contract or negotiated warranty includes provisions that limit how the battery can operate in [CA]ISO's markets. However, managing potential maintenance costs through contractual limitations or negotiated warranties could result in inefficient utilization of battery resources in wholesale electricity markets.

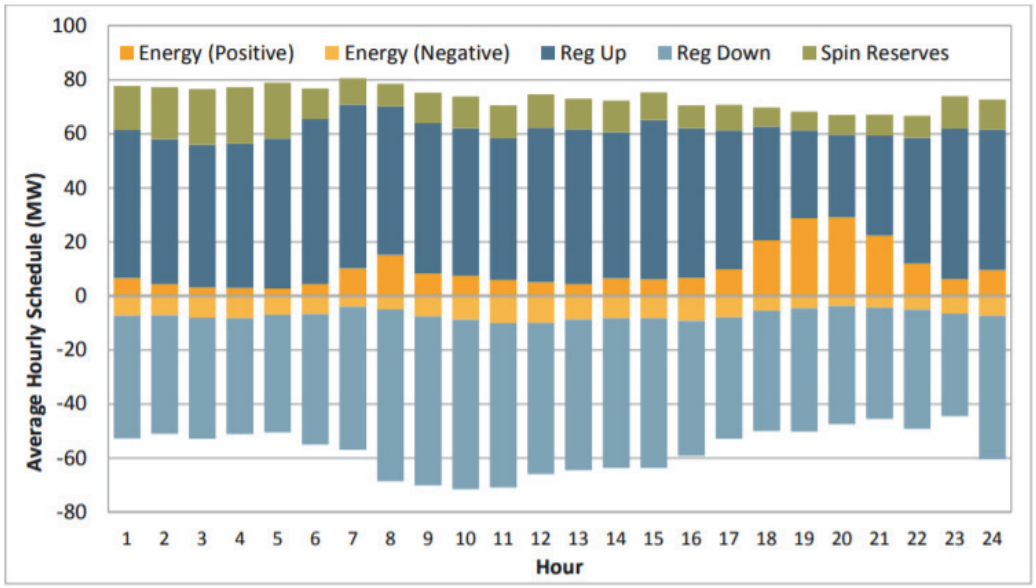
capital expenditures required to replace battery cells more frequently than contemplated due to more frequent and/or deeper cycling.[10] Furthermore, bidding or other behavior that limits cycling would reduce the effectiveness of such resources to address operational and renewable integration needs, especially in the constrained local areas and sub-areas during peak net load periods.[11]

Although modeling exercises are informative, the CAISO urges the Commission to consider whether the operational and market behavior of certain storage technologies aligns with actual operational needs. Figure 1 below presents analysis from the CAISO's DMM regarding 2018 average hourly schedules for battery storage resources participating in the CAISO markets. Figure 1 shows that existing storage resources are largely providing regulation services rather than shifting large quantities of excess midday energy to the late day net load upward ramping period. Contrary to the DMM's findings, current modeling expects storage resources to provide large and favorable load shift and shaping to help meet California's reliability and renewable integration needs.

[10] *Id*.
[11] *Id.*, p. 271:

> Moreover, the ISO does not permit market participants to constrain resource parameters below the resource's actual physical operating characteristics in order to manage contractual limitations or to limit costs, such as major maintenance costs. Artificially constraining resource parameters could lead to inefficient market outcomes if a battery resource dispatch that may be part of a least cost market solution does not occur because the resource is constrained by a physical-type parameter set below the battery's actual physical characteristics.

Figure 1: Average hourly battery schedules (2018)



Source: Department of Market Monitoring, *2018 Annual Report on Market Issues and Performance*, May 2019, Figure 1.11: Average hourly battery schedules (2018).

Given the different short- and long-term operational capabilities, Energy Division should not assume homogeneity of storage technologies in its ELCC modeling. Some storage technologies are well suited for providing regulation while others are better suited to provide bulk energy shifting. ELCC modeling should differentiate between storage technology types because different technologies will have significantly different impacts on the ELCC values for wind and solar resources. In an analogous context, the ELCC modeling already properly differentiates between thermal resources based on their basic operating characteristics (*i.e.*, combined cycles, gas peakers, and nuclear reactors are modeled differently). The ELCC modeling should capture differences in storage technologies in a similar manner.

At this nascent stage of storage penetration in the market, the Commission should also seek to diversify the storage fleet and explore technologies that can cost-effectively cycle as necessary to provide the diversity and renewable integration benefits needed. The Commission must begin considering the energy ($/MWh) cost of storage, not just its capacity cost ($/MW). Doing so will help ensure the most cost-effective storage technologies are supported and developed.

4. The Commission should clarify that the ELCC methodology adopted in the Proposed Decision will only be used for the 2020 Resource Adequacy year.

As noted above, the CAISO agrees with the general directional shift in ELCC values. However, as detailed above, the Commission must address significant flaws in the ELCC methodology in the next resource adequacy cycle. The CAISO does not oppose adopting the proposed ELCC values for the 2020 RA cycle, but these values should apply *only* for the 2020 resource adequacy year and the fundamental ELCC methodology issues should be resolved prior to establishing 2021 ELCC values. In the next resource adequacy cycle and in the IRP, the Commission should adopt an LOLE target that aligns with generally accepted NERC principles.[12] CAISO does not believe these standards are achieved long-term by adopting the current methodologies for any longer than a single year.

B. Counting methodologies for hydro and other use-limited resources

The Proposed Decision correctly defers acting on Pacific Gas & Electric Company's (PG&E) proposed counting methodologies for hydro and other use-limited resources. The Proposed Decision notes that the CAISO supported exploring updates to the counting methodology for hydro resources, but the CAISO clarifies that it does not support the specific counting methodologies proposed by PG&E at the March 12-13, 2019 Workshops. Specifically, the CAISO does not support creating separate compliance and operational qualifying capacity values for hydro or use-limited resources because the qualifying capacity value should reflect a resource's capability to perform. The CAISO looks forward to discussing possible new hydro and use-limited resource counting methodologies in the context of the working group established by the Proposed Decision.

C. ELCC Applied to Demand Response

As the Commission refines its ELCC methodology and application, the CAISO encourages the Commission to evaluate demand response resources under an ELCC methodology. Most demand response resources have a variable maximum capacity output, making demand response more closely aligned with variable energy resources than traditional

[12] *Methods to Model and Calculate Capacity Contributions of Variable Generation for Resource Adequacy Planning to Ensure Reliability of the Bulk Power System,* NERC (March 2011), p. 10, available at: https://www.nerc.com/files/IVGTF1-2.pdf.

resources with fixed resource adequacy net qualifying capacity values. Given the variable nature of demand response, the Commission should evaluate demand response relative to its capacity value across the year given its availability and duration constraints and the fact that its output can vary significantly by season, month, day, and even hour. The Commission should take up the evaluation of demand response in its future efforts to refine its ELCC methodology. Doing so will enable the Commission to better understand the reliability value of demand response to the system and assess its relative economic value. The ability to compare the resource adequacy contribution across different resource types is essential as the Commission seeks to invest in the most cost-effective and reliability sustaining preferred resources.

III. Conclusion

The CAISO appreciates the opportunity to provide comments on the Proposed Decision and looks forward to working with the Commission to further improve the ELCC methodology in future resource adequacy proceedings.

Respectfully submitted,

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