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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Develop an Electricity Integrated Resource Planning Framework and to Coordinate and Refine Long-Term Procurement Planning Requirements.	Rulemaking 16-02-007 (Filed February 11, 2016)

COMMENTS OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

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The California Independent System Operator Corporation (CAISO) hereby provides comments in response to the *Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Actions* (Ruling), filed on November 6, 2019.

I. Introduction

The CAISO appreciates this opportunity to comment and the significant effort Commission Energy Division staff have made to conduct additional modeling. Given the modeling results and analyses presented thus far, the CAISO recommends the Commission take the following immediate actions:

- **The Commission should transmit the Preferred System Plan from the 2017-2018 IRP cycle as the reliability and policy-driven base case for the CAISO's 2020-21 transmission planning process.**

The 46 MMT Alternate Scenario is insufficient to serve as the base case in the transmission planning process because it will cause significant uncertainty regarding planned and future transmission infrastructure needs. The 46 MMT Alternate Scenario is flawed in a number of ways, which the CAISO describes in detail below.

First, the 46 MMT Alternate Scenario includes 2,000 MW of generic effective capacity, which the CAISO cannot model in the transmission planning process because such capacity does not have operational or locational characteristics. However, the Energy Division staff modeling results show that the portfolio is unreliable without this additional generic capacity.

Second, the 46 MMT Alternate Scenario creates unwarranted instability in renewable portfolio mapping, primarily by moving expected renewable build-outs to different locations

without substantive justification. The Commission should address renewable portfolio mapping consistency before transmitting a new portfolio to the CAISO because these portfolios and their specific renewable resource locations are the foundation for determining the need for projects in the transmission planning process and, subsequently, the Commission's transmission infrastructure permitting and siting applications. The changes reflected in the current 46 MMT Alternate Scenario upend prior Commission-developed portfolios without sufficient justification.

Third, the 46 MMT Alternate Scenario does not provide locational mapping for over 11,000 MW of storage resources.[1] This means that the CAISO will not model these resources in the transmission planning process and would therefore render the portfolio unable to meet the Commission's own requirements for resource adequacy, reliability, greenhouse gas (GHG) emissions, and renewable energy targets.

In summary, using the 46 MMT Alternate Scenario would undermine the credibility of the transmission planning process and cast doubt on the whether the outputs of the Integrated Resource Planning (IRP) process are usable for transmission planning purposes. The Commission must address all three of the issues identified above prior to the CAISO using the 46 MMT Alternate Scenario for transmission planning purposes. In the near term, rather than using the 46 MMT Alternate Scenario in the transmission planning process, the Commission should transmit the 2018-2019 Preferred System Plan to be used as the reliability and policy-driven base case in the 2020-21 transmission planning process. The Commission has previously acknowledged that it can adopt one portfolio as the Reference System Plan and transmit a different portfolio for CAISO transmission planning purposes.[2]

- **The Commission should continue to make modeling improvements to the 46 MMT Alternate Scenario.**

The Commission should continue to iterate between the RESOLVE and SERVM models to achieve a reliable portfolio that meets the 1-in-10 loss of load expectation (LOLE) and state goals without using generic effective capacity. Importantly, the modeling should align the energy and resource adequacy import limits, reflect the peak day of the year, and should consider a 2045 end year due to the vastly different capacity expansion results. The Commission should

[1] The CAISO notes that the Reference System Plan does not provide locational mapping for any non-renewable generic resources, the vast majority of which are storage resources.
[2] California Public Utilities Commission, *Decision Setting Requirements for Load Serving Entities Filing Integrated Resource Plans*, , Feb 13, 2018, p. 104-105. (D.18-02-018)

aim to accomplish these modeling improvements before it produces the next Preferred System Plan.

The Commission should also develop guidelines for siting non-renewable generic capacity for modeling purposes and ensure that renewables portfolios transmitted to the CAISO reflect a level of modeling stability and certainty with regard to locational mapping. The CAISO and stakeholders need these guidelines so the transmission planning process can provide an actionable assessment of load and supply flow impacts on the transmission system.

In addition to the above actions, the Commission should consider whether once-through cooling (OTC) resources recommended for compliance extension up through 2023 should be included in the 46 MMT Alternate Scenario or any baseline modeling as these resources were not included in the baseline spreadsheet released by the Commission on December 2.[3] Ideally, the RESOLVE modeling should try to create an optimal portfolio without any of the extended OTC resources to understand what characteristics and level of incremental procurement is needed to serve load reliably without them.

- **The Commission should reassess the current IRP process and timelines.**

The current IRP cycle revealed several modeling complexities that Energy Division staff and parties did not have adequate time to properly identify and resolve prior to issuing the proposed Reference System Plan. It may be appropriate to reassess the current IRP process and timelines for developing and vetting portfolios to ensure sufficient time for party feedback and potential action by Energy Division staff.

II. Discussion

A. Background

The CAISO's comments focus on the 46 MMT Alternate Scenario, which is the proposed Reference System Portfolio. The 46 MMT Alternate Scenario includes the following major changes from the Default case:

[3] California Public Utilities Commission, *Decision Requiring Electric System Reliability Procurement for 2021 – 2023*, Nov 13, 2019, (D. 19-11-016). Ordering Paragraph #6 of D. 19-11-016 required Energy Division staff to provide a baseline list of resources. The Commission posted such as list on its website on December 2, 2019.

- Candidate solar resource potential was subject to a deployment limit of 2,000 MW/year for utility-scale solar resources through 2023, and none thereafter, to reflect challenges to rapid deployment of new capacity;[4]
- To reflect D. 19-11-016, 2,289 MW of partially extended once through cooling (OTC) generation capacity was modeled through 2023 and none thereafter;[5]
- To reflect resource adequacy requirements, the RESOLVE model employed a planning reserve margin (PRM) constraint so that the resultant portfolio must always have enough effective capacity to meet a 15 percent PRM. As a default, RESOLVE assumes that 5,000 MW of imports can count towards effective capacity to meet resource adequacy requirements.[6] Up through 2024, an additional 1,937 MW of resource adequacy import capacity was modeled to reflect Hoover, Palo Verde and the Intermountain Power Plant capacities for a total of 6,937 MW.[7] After the Intermountain Power Plant retires in 2024, the total resource adequacy import limit decreases to 6,457 MW. Separately, the RESOLVE model has a simultaneous energy import limit of 12,145 MW through 2024, decreasing to 11,665 MW after 2024 to reflect the retirement of the Intermountain Power Plant.
- RESOLVE modeled 37 representative days but did not include the 1-in-2 peak load day itself. The highest load day modeled is 44,979 MW whereas the California Energy Commission's Integrated Energy Policy Report 2030 mid-mid CAISO annual managed peak load is 45,770 MW, a difference of 791 MW.
- In the SERVM model, a simultaneous import limit of 5,000 MW was applied for all hours where gross electric demand is higher than the 95th percentile.[8] This limit does not include Hoover, Palo Verde or the Intermountain Power Plant.

[4] California Public Utilities Commission, R.16-02-007, *Administrative Law Judge's Ruling Seeking Comment on Proposed Reference System Portfolio and Related Policy Action*, November 6, 2019, p. 12 and Attachment A, pp. 122-125. (November 6, Ruling)
[5]November 6, Ruling, p. 12 and Attachment A, p. 124.
[6] November 6, Ruling, Attachment B, p. 11.
[7] Capacity assumptions are: Hoover at 822 MW, Palo Verde at 635 MW; and Intermountain Power Plant at 480 MW.
[8] November 6, Ruling, p. 16, Attachment A, p. 136, and Attachment B, p. 11.

- Energy Division staff manually added 2,000 MW of generic effective (*i.e.*, "perfect") capacity in 2026 and 2030 after it discovered that the original RESOLVE portfolio could not meet the 0.1 loss of load expectation (LOLE) standard.[9]

B. The Commission Should Transmit the Preferred System Plan from the 2017-2018 IRP Cycle as the Reliability and Policy-Driven Base Case and Continue to Improve Modeling and Coordination Processes.

The CAISO appreciates the Energy Division staff's efforts to improve the modeling assumptions to better reflect resource adequacy contracting, incorporate the Commission's recent procurement track decision, and adhere to a timeline that allows for portfolio transmittal to the CAISO for transmission planning purposes. However, the 46 MMT Alternate Scenario is insufficient to serve as the base case in the transmission planning process because it will potentially cause significant uncertainty regarding planned and future transmission infrastructure needs. The 46 MMT Alternate Scenario is flawed in three main aspects: (1) inclusion of 2,000 MW of generic effective capacity; (2) unwarranted changes in renewable resource locations; and (3) unmapped storage resources that cannot be modeled in the transmission planning process.

Using the 46 MMT Alternate Scenario with its current flaws would undermine the credibility of the CAISO's transmission planning process and cast doubt on whether the outputs of the IRP are usable for transmission planning purposes. The Commission should resolve all three flaws because any one of them will have the same negative impact. Until all three of these issues are resolved, the Commission should transmit the Preferred System Plan portfolio developed in the 2017-2018 integrated resource plan (IRP) cycle as the reliability and policy-driven base case for the 2020-21 transmission planning process. The CAISO believes transmitting a portfolio for base case study in the transmission planning process is a separate decision from designating a Reference System Plan and is open to studying the 46 MMT Alternate Scenario or a similar portfolio as a sensitivity in the 2020-21 transmission planning process.

[9] November 6, Ruling, p. 16, Attachment A, p. 137, and Attachment B, pp. 19-25.

1. The CAISO Cannot Use the 46 MMT Alternate Scenario for Transmission Planning Purposes.

Energy Division staff found that the 46 MMT Alternate Scenario produced an unreliable portfolio based on established LOLE criteria and SERVM modeling results. As a result, Energy Division staff manually added 2,000 MW of generic effective capacity— defined as "a perfectly dispatchable peaker with zero emissions," which "[i]n reality" could be "firm imports, batteries paired with solar, geothermal, more economic retention of existing thermal generation, demand response, or other."[10] It is difficult to reconcile how this broad list of disparate resources can each meet the definition of "a perfectly dispatchable peaker with zero emissions," especially in the context of transmission planning analysis.

The CAISO relies on the Commission to provide reliability and policy-driven portfolios due to the Commission's jurisdiction over resource adequacy-based procurement. A May 2010 memorandum of understanding between the CAISO and the Commission, and in coordination with the California Energy Commission (CEC), codifies the process by which the Commission develops the resource portfolios to be used by the CAISO in its annual transmission planning process.[11] The CAISO uses the portfolios transmitted by the Commission in performing reliability, policy, and economic assessments in the transmission planning process. Consistent with the coordinated process outlined in the memorandum of understanding, the CAISO approves transmission projects based on the portfolios provided by the Commission.

Due to the Commission's role in resource planning, the CAISO will not unilaterally change the Commission-developed portfolios to replace the generic effective capacity with a specific set of resources. The CAISO's transmission planning analysis cannot model capacity with unknown operating characteristics. The Commission should provide operational and physical details for new capacity resources, including whether the capacity is renewable or not, whether it is one resource or many aggregated together, and where the capacity is located. All of this foundational information is essential for the CAISO to conduct its planning analyses and to understand the flow impacts on the transmission system.

[10] November 6, Ruling Attachment B, p. 19.
[11] See: https://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442462040

Consequently, if the CAISO does not model the 2,000 MW of generic capacity, the transmission planning process will be using an unreliable portfolio. Energy Division staff's own analysis shows that without the generic resources the 46 MMT Alternate Scenario causes reliability shortfalls in the evening net peak hours after the sun sets.[12] Studying a portfolio with a known 2,000 MW resource deficiency will have a negative impact on the transmission planning process because the additional generation can change the flows in the modeling and affect the outcome of the final transmission plan. For example, if the CAISO identifies a reliability shortfall, there will be no way to differentiate whether the shortfall is due to an insufficient resource portfolio or another transmission-related issue. If the CAISO uses the current portfolio in the transmission planning process, the CAISO runs the dual risks of delaying action on needed transmission upgrades or potentially initiating action on transmission projects that would otherwise be addressed by generation resources.

2. The CAISO Cannot Use the 46 MMT Alternate Scenario for Transmission Planning Purposes because it Creates Unwarranted Instability in Renewable Portfolio Mapping.

The CAISO's annual transmission planning process is cumulative so that each year's plan successively relies on the results of previous years' analyses. This incremental approach provides stability for both infrastructure developers and load-serving entities by ensuring that transmission projects approved in one transmission planning cycle will not be undone in the next, unless circumstances have changed sufficiently to warrant a revision. This stability was appreciated and highlighted in a joint letter from former Commission President Picker and former CEC Chair Weisenmiller noting that "[i]t is undesirable to use a renewable portfolio in the [transmission planning process] base case that might require reexamination of previously approved transmission investment decisions."[13]

The 46 MMT Alternate Scenario identifies renewable portfolios that have very different locational mapping from those used in prior transmission planning cycles. The CAISO relies on the specific locational mapping provided by the Commission because these portfolios and their specific renewable resource locations reflect a variety of state considerations (*e.g.*, land use and resource capability). The renewable portfolios then serve as the foundation for determining the

[12] November 6, Ruling, Attachment B, *Hours with Expected Unserved Energy (EUE) Occur in the Evening*, p. 21.
[13] http://www.caiso.com/Documents/2016-2017RenewablePortfoliosTransmittalLetter.pdf

need for transmission projects in the transmission planning process. Subsequently, these same transmission projects may proceed through the Commission's transmission infrastructure permitting and siting processes, in which the renewable portfolios are again critical to establishing project need.

Based on the CAISO's observations, the changes in locational mapping for renewable resources appear to be unrelated to changing exogenous factors (*i.e.,* demand), but rather are due to continuous modeling refinements. Although the CAISO fully supports improving the RESOLVE modeling, Commission should not implement major changes to the renewable resource mapping until and unless it can assure a reasonable degree of consistency. The Commission should continue to vet the recent modeling refinements because the changes to the renewable portfolios in the current 46 MMT Alternate Scenario upend prior Commission-developed portfolios. In the meantime, the Commission should default to the mapping presented in the Preferred System Plan from the 2017-2018 cycle.

3. The CAISO Cannot Use the 46 MMT Alternate Scenario for Transmission Planning Purposes because it Requires Removal of over 11,000 MW of Storage.

The 46 MMT Alternate Scenario does not provide locational mapping for over 11,000 MW of battery storage. As described above, the transmission planning process analyzes the flow impacts of load and generation on the transmission system to meet reliability and public policy needs. The CAISO uses the Commission-developed portfolios as an input into its transmission planning process with the assumption that the portfolios already reflect generation and resource capability sufficient to meet resource adequacy, renewable portfolio standard targets, and other state goals. For renewable generation specifically, the Commission-developed portfolios identify the locations for new capacity additions. The Commission develops this high-level siting information based on land use availability, resource capability, and related implications. In contrast, the Commission-developed portfolios do not provide locational data for incremental non-renewable generic resources, such as storage.

Historically, the lack of locational information for non-renewable generation has not been problematic due to the relatively small amounts of storage in the Commission-developed portfolios. However, the lack of detailed information regarding the location of future storage resource did create a process gap between the IRP and the transmission planning process. For example, the Preferred System Portfolio transmitted for the 2019-20 transmission planning

process included over 2,000 MW of generic storage capacity with no specified location. Without Commission guidance on resource mapping in the modeling, the CAISO does not plan to directly model these storage resources in the transmission planning process. Instead, the CAISO—in consultation with Energy Division staff and as communicated to market participants—plans to model the generic storage offline in the initial base cases and will use the incremental storage capacity as mitigation after identifying reliability concerns.[14] The CAISO will generally model the same storage operating characteristics as used in IRP modeling with the addition of illustrative cycling costs and can tailor the capacity size to address the identified transmission reliability needs.[15]

In the 46 MMT Alternate Scenario, the scale of generic storage capacity is appreciably larger than any previous portfolio—11,384 MW by 2030.[16] Without locational mapping or even guidelines from the Commission, the CAISO will not be able to model this significant quantity of unmapped storage capacity in the transmission planning process. Instead, the CAISO would remove the generic storage resources from the transmission planning analysis as it did in the 2019-20 transmission planning cycle. However, unlike the 2019-20 transmission planning process, the CAISO cannot unilaterally use such a large amount of capacity as a mitigation measure. The volume is simply too large and the overall impact on the system is too unpredictable. Without locational mapping, the 46 MMT Alternate Scenario's inclusion of 11,384 MW of generic storage resources undermines the CAISO's transmission planning analysis because the models will not be able to accurately test the flows on the transmission system and identify reliability needs. Similar to concerns expressed above, this could lead to triggering transmission projects that may not have been needed or masking reliability needs that do exist.

As a result, the Commission should develop a process for mapping storage resources (and all other non-renewable generic capacity) for modeling purposes based on priority needs. For example, the Commission could first prioritize using incremental storage resources to address

[14] California Independent System Operator, *Final Study Plan, 2019-2020 Transmission Planning Process*, April 3, 2019, p. 23. Available at: http://www.caiso.com/Documents/Final2019-2020StudyPlan.pdf.
[15] For the CAISO's proposal on illustrative lithium ion battery *see*: California Independent System Operator, *Reliability Assessment and Study Updates, 2019-2020 Transmission Planning Process Stakeholder Meeting*, September 25-26, 2019, pp. 19-25. Available at: http://www.caiso.com/Documents/Day1-Presentations-2019-2020TransmissionPlanningProcessMeeting-Sep25-26.pdf.
[16] November 6, Ruling, p. 15.

local capacity area concerns, then with existing solar installations to create hybrid resources, and then to address Aliso Canyon-related concerns. To establish these priorities, the CAISO can provide technical feedback such recharging capabilities, commercial interest (via the interconnection queue), or other important information. The Commission should develop this process before transmitting a portfolio with large amounts of storage resources (or other non-renewable generic capacity).

4. The Commission Should Continue to Investigate Why RESOLVE Produces Unreliable Portfolios.

The Commission should continue to analyze why an optimized portfolio from RESOLVE does not meet basic reliability needs when modeled in SERVM. Ideally, the Energy Division staff would have iterated between the RESOLVE and SERVM models to eliminate the need for generic effective capacity and meet the 0.1 LOLE standard. However, this was not possible based on the schedule for this proceeding. The Commission should take time now to conduct this important investigation to understand whether RESOLVE's current modeling capabilities are insufficient to identify reliability issues or whether changes to inputs and assumptions are sufficient to ensure reliable portfolios. The CAISO provides several examples of assumptions that should be changed and could impact the RESOLVE results:

- **Using the Peak Load Day.** RESOLVE does not model the forecasted peak load day of the year as one of its representative 37 days. The highest load day modeled in RESOLVE is 44,979 MW whereas the California Energy Commission's Integrated Energy Policy Report 2030 mid-mid CAISO annual managed peak load is 45,770 MW—a difference of 791 MW. The portfolio created by RESOLVE based on sub-peak load may result in loss of load hours in SERVM more than the 0.1 LOLE criterion allows. The peak load day should be included in the 37 days modeled in RESOLVE. [17]
- **Reducing the Simultaneous Energy Import Limit.** RESOLVE's simultaneous energy import limit should be reduced to match the resource adequacy import limit. Specifically, both limits should be 6,937 MW through 2024 to reflect 5,000 MW of assumed imports based on historical contracting, plus the capacity from Hoover (822

[17] CAISO staff already made this request verbally at the IRP Modeling Advisory Group (MAG) webinar on November 20, 2019.

MW), Palo Verde (635 MW), and the Intermountain Power Plant (480 MW). After 2024, both limits should be decreased to 6,457 MW to reflect the retirement of the Intermountain Power Plant.

- **Changing the End Year Analysis to 2045.** Based on Energy Division staff's 2045 Framing Study,[18] changing the ending year of the RESOLVE analysis greatly impacts the capacity expansion and gas capacity retention decisions for the for earlier years (*i.e.*, 2030). The Commission should change the final run year in its modeling to 2045 to better capture and understand differences in interim year needs.
- **Removing OTC Resource Capacity.** The Commission should remove the 2,289 MW of OTC resources extended through 2023 from the RESOLVE model. The CAISO notes that these resources were not included in the baseline spreadsheet released by the Commission on December 2, 2019.[19] Ideally, the IRP modeling should reflect the phasing in of the 3,300 MW incremental procurement authorized by the Commission and only rely on the OTC as a backstop. By including the 2,289 MW of OTC capacity in RESOLVE, the model will use that OTC capacity as an input assumption with no opportunity to retire those facilities earlier. The RESOLVE modeling should try to create an optimal portfolio without the OTC resources to understand the quantity and resource characteristics of capacity needed to serve load reliably.

5. The Commission Should Refine the IRP Process Timeline to Incorporate Party Feedback.

The CAISO appreciates the many improvements made to the modeling framework, especially with regard to reliability and coordination with the CAISO's transmission planning process tariff-mandated timelines. The current cycle has revealed several modeling complexities that Energy Division staff and parties did not have enough time to appropriately vet and resolve before the current Ruling on a proposed Reference System Plan. The CAISO recommends that the Commission reassess the process and timelines for developing and vetting portfolios to ensure sufficient time for party feedback and potential action by Energy Division staff. The CAISO looks forward to engaging with the Commission, Energy Division staff, and parties on

[18] November 6, Ruling, Attachment A, Appendix A: 2045 Framing Study, pp. 148-166.
[19] (D. 19-11-016). Ordering Paragraph #6 of D. 19-11-016 required Energy Division staff to provide a baseline list of resources. The Commission posted such as list on its website on December 2, 2019.

this effort.

III. Responses to Ruling Questions

The CAISO provides responses to specific questions posed in the Ruing below. For clarity, the CAISO reproduces the full question from the Ruling prior to providing the relevant CAISO response. For all responses, a more comprehensive narrative and context is provided in Section II above.

Ruling Question No. 1. Please provide any comments on the use of the RESOLVE model.

As noted in detail above, RESOLVE's current modeling capabilities are insufficient to identify reliability issues in advance of SERVM modeling. The Commission should seek to close the reliability gap between RESOLVE and SERVM by achieving the 1-in-10 LOLE reliability metric rather than rely on generic effective capacity. The Commission should improve the actual modeling functionality and/or change the input assumptions or modeling parameters in RESOLVE. For example, RESOLVE should model the actual peak day of the year as one of its 37 representative days. The Commission should also align the modeling of the simultaneous energy import constraint to match the resource adequacy import limit. Specifically, both limits should be 6,937 MW through 2024 to reflect 5,000 MW of assumed imports based on historical contracting plus Hoover (822 MW), Palo Verde (635 MW), and Intermountain Power Plant (480 MW). After 2024, the both limits should be decreased to 6,457 MW to reflect the retirement of the Intermountain Power Plant. Lastly, the Commission should consider a 2045 end year due to the vastly different capacity expansion results due to differences in the model run end years.

Ruling Question No. 2. Provide any comments on the use of SERVM.

The CAISO supports the continued use of a production cost modeling-based reliability check.

Ruling Question No. 3. Provide any comments on baseline assumptions.

The Commission may need to reconsider the inclusion of any extended OTC resources in the baseline as these resources were not listed on the baseline resource spreadsheet published by the Commission. Including them may mask the need for resources and capabilities that incremental procurement should address and does not allow for early retirement of these resources.

Ruling Question No. 5. Provide any comments on the scenarios and sensitivities modeled.
As described in more detail above, the 46 MMT Alternate Scenario is flawed in three main aspects: (1) inclusion of generic effective capacity; (2) unwarranted changes in renewable resource locations; and (3) unmapped storage resources (and all generic non-renewables) which lead to their omission in the transmission planning process. The Commission should resolve these concerns as soon as possible and before the next Preferred System Plan.

Ruling Question No. 7. Provide any comments on the results from the major scenarios or sensitivities analyzed by Commission staff to develop the RSP recommendation.
See response to Question 5.

Ruling Question No. 8. Comment on the modifications to SERVM made by Commission staff to approximate RESOLVE's PRM constraint, which limits the amount of imports that can count towards resource adequacy. Were the changes appropriate? Why or why not?
The CAISO supports the changes made to SERVM so that it can reflect the PRM constraint. See response to Question 1.

Ruling Question No. 9. Comment on the manual addition of 2,000 MW of "generic effective capacity" in order to produce a portfolio with an LOLE result of less than 0.1. Would you recommend a different way of depicting the reliability gap in the portfolio? If so, describe in detail.
See response to Question 5. The Commission should continue efforts to iterate between RESOLVE and SERVM models to achieve a reliable portfolio that meets state goals without the manual addition of generic effective capacity. The CAISO cannot model generic effective capacity in the transmission planning process because it does not have operational or locational characteristics. This other resource characteristic information is essential for the CAISO to conduct its planning analyses and to understand the flow impacts on the transmission system. Consequently, if the CAISO removes the 2,000 MW of generic capacity, the transmission planning process will be using a portfolio that Energy Division staff already found to be unreliable, typically showing reliability shortfalls in the evening net peak hours after the sun sets.

Studying a portfolio with a known 2,000 MW deficiency will have a negative impact on the transmission planning process because the additional generation can change the flows in the modeling and affect the outcome of the final transmission plan. For example, if the CAISO identifies a reliability shortfall, there will be no way to differentiate whether the shortfall was created by the removal of the generic effective capacity or another transmission-related issue. If the current portfolio is used in the CAISO's transmission planning process, the CAISO runs the risk of delaying action on needed upgrades, or potentially initiating action where it is not warranted. The risk also impacts the Commission via its transmission infrastructure permitting and siting applications.

Ruling Question No. 11. Are you concerned about the risk of overreliance on solar as part of the recommended portfolio? Why or why not?

See responses to Question 5 and 9. Based on the results presented by Energy Division staff, most of the hours with expected unserved energy occur in the evening and the manual addition of generic effective capacity aimed to address those needs.[20] In addition, the CAISO has begun considering the impact of multiple days of cloud coverage which will reduce solar production and the ability of storage to charge from solar resources.[21]

Ruling Question No. 12. Are you concerned about the risk of overreliance on battery storage as part of the recommended portfolio? Why or why not?

The CAISO is concerned that cycling and replacement costs are not fully considered in the Energy Division staff's modeling of battery storage. The CAISO has begun discussing illustrative costs with stakeholders to improve modeling of these resources.[22] The Commission should consider similar costs. In addition, the CAISO has begun considering the impact of multiple days of cloud coverage which will reduce solar production and the ability of storage to charge from solar resources.[23]

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[20] November 6, Ruling Attachment B, *Hours with Expected Unserved Energy (EUE) Occur in the Evening*, p. 21.
[21] *See*: http://www.caiso.com/Documents/BriefingonPost2020GridOperationalOutlook-Presentation-Dec2019.pdf
[22] For the CAISO's proposal on illustrative lithium ion battery see: California Independent System Operator, *Reliability Assessment and Study Updates, 2019-2020 Transmission Planning Process Stakeholder Meeting*, September 25-26, 2019, pp. 19-25. Available at: http://www.caiso.com/Documents/Day1-Presentations-2019-2020TransmissionPlanningProcessMeeting-Sep25-26.pdf.
[23] *See*: http://www.caiso.com/Documents/BriefingonPost2020GridOperationalOutlook-Presentation-Dec2019.pdf

Ruling Question No. 13. Is the retention of most or all of the current thermal generation fleet reasonable and realistic? Why or why not?

There are several observations that may lead to the prudent retention of the current thermal generation fleet based on IRP modeling results. First, based on the Energy Division staff's 2045 Framing Study, the gas capacity retention is different depending on the modeling end year. This introduces some uncertainty into the actual date by which significant portions of the gas fleet can be retired. Second, Energy Division staff added 2,000 MW generic effective capacity which was described as potentially being economic retention of existing thermal generation.[24] This implies that current thermal generation may be needed to maintain reliability, bringing into doubt the reasonableness of the 3,704 MW of economic thermal retirement in 2030 in the 46 MMT Alternate Scenario. Lastly, as noted in response to Question 11, much of the unserved energy occurs in the evening hours when thermal generation would be operating. If battery storage is to serve this need instead of thermal generation, the Commission should include cycling and replacement costs.

Ruling Question No. 14. Do you have additional comments about the portfolio associated with the 46 MMT Alternate Scenario?

See response to Question 5. Based on observations about the 46 MMT Alternate Scenario, and as applicable to all future portfolios, the Commission should develop a process for siting non-renewable generic capacity and to ensure modeling stability for renewable resource locational mapping.

Ruling Question No. 15. Should the Commission take steps to begin development of transmission and/or generation from geothermal resource areas? If so, what steps? If not, why not?

The Commission should improve RESOLVE's modeling capabilities as explained above and use 2045 as the last run year in order to understand whether such resources are needed. For example, the CAISO sensitivity studies of the 2017-18 IRP Hybrid Conforming Portfolio found that geothermal, though having higher per MW Total Resource Cost than solar, has a higher energy

[24] November 6, Ruling Attachment B, p. 19.

content (*i.e.*, capacity factor) and more distributed generation output across the day leading to lower renewable curtailment and production costs.

Ruling Question No. 16. Should the Commission take steps to support the development of at least one pumped storage facility in California? If so, what steps? If not, why not?
The Commission should improve RESOLVE's modeling capabilities and use 2045 as the last run year in order to understand whether such resources are needed.

Ruling Question No. 17. Are there other actions the Commission should take specifically with respect to replacement capacity for the Diablo Canyon nuclear plant? Describe in detail.
See responses to Questions 15 and 16.

Ruling Question No. 19. Comment on the recommendation to use the 46 MMT Alternate Scenario as the reliability and policy-driven base cases for the next CAISO transmission planning process.
See response to Question 5 and detailed discussion above about the three main flaws. Using the 46 MMT Alternate Scenario with its current flaws would undermine the credibility of the CAISO's transmission planning process and cast doubt on whether the outputs of the IRP are usable for transmission planning purposes. Until these issues are resolved, the Commission should transmit the Preferred System Plan portfolio developed in the 2017-2018 integrated resource plan (IRP) cycle as the reliability and policy-driven base case for the 2020-21 transmission planning process. The Commission must address all three of the issues identified above prior to the CAISO using the 46 MMT Alternate Scenario for transmission planning purposes. The CAISO believes transmitting a portfolio for base case study in the transmission planning process is a separate decision from designating a Reference System Plan and is open to studying the 46 MMT Alternate Scenario or a similar portfolio as a sensitivity in the 2020-21 transmission planning process.

Ruling Question No. 20. Comment on the recommendations for policy-driven sensitivities around curtailment in particular transmission zones and the associated impact on EO or

full deliverability for renewables.

With potential generic resources being considered in areas where there has not been previous assessment of transmission capability for increased levels of EO or full deliverability for renewables, the sensitivity studies could stress some of the areas to determine system capability and curtailment issues related to the integration of renewables in these areas.

Ruling Question No. 21. Comment on the suggested process for seeking formal input on busbar mapping of the proposed RSP.

The CAISO agrees with the current approach provided for busbar mapping of renewable resources. As described in comments above, the Commission should provide guidance on siting non-renewable generic capacity.

IV. Conclusion

The CAISO appreciates the opportunity to comment on the proposed Reference System Plan and the Commission's IRP process.

Respectfully submitted,

By: *<u>/s/ Jordan Pinjuv</u>*

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