BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes	R.20-05-003 (Filed May 7, 2020)

REPLY COMMENTS OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION ON ADMINISTRATIVE LAW JUDGE'S RULING

I. Introduction

The California Independent System Operator Corporation (CAISO) hereby provides reply comments on the *Administrative Law Judge's Ruling Seeking Feedback on Mid-Term Reliability Analysis and Proposed Procurement Requirements* (Ruling).

II. Discussion

It is critical the Commission authorize procurement of 10,000 MW in additional effective capacity to address mid-term reliability needs. The Commission should require load serving entities to procure this additional capacity to be online by 2025. To accomplish this goal, the Commission should issue its decision in this proceeding by June 2021. Timely capacity procurement is necessary to simultaneously address Diablo Canyon Power Plant (Diablo Canyon) retirement and maintain reliability. Incremental capacity procurement is also critical to ensure the once-through cooling (OTC) resources can retire as planned. Importantly, given the large overall incremental buildout needed over the longer-term (*i.e.*, through 2031), any risk of over-procurement in the mid-term is *de minimis*. The CAISO's modeling indicates 10,000 MW or more additional effective capacity will be necessary by 2026. By requiring this incremental procurement by 2025, before Diablo Canyon is fully retired, the Commission will ensure post-Diablo Canyon retirement system needs are timely and adequately addressed while also providing a path for well-planned long-term reliability.

There are significant risks associated with under-procuring capacity in the mid-term. Piecemeal or inadequate capacity procurement now will short-change rational planning for long-lead time resources. This may ultimately reduce resource diversity and require additional

emergency procurement and/or reliability issues in the futures. To avoid those outcomes, the Commission should direct 10,000 MW of incremental capacity procurement now.

Planning for and procuring 10,000 MW of additional capacity will be a significant undertaking, and the CAISO stands ready to support the Commission and load serving entity efforts through the transmission planning process. In these comments, the CAISO also suggests how the Commission can manage the planning and online dates of incremental capacity. However, the Commission must first authorize the necessary capacity procurement to start the process and ensure reliability can be maintained.

The CAISO provides reply comments regarding the need to integrate load serving entity procurement and transmission planning more effectively by encouraging procurement consistent with previously studied resource portfolios.

A. The Commission Should Issue a Decision By June 2021 Directing Procurement of a Minimum of 10,000 MW in Incremental Capacity by 2025.

The CAISO agrees with the majority of party comments supporting incremental capacity procurement to ensure mid-term reliability.[1] The CAISO strongly agrees with Southern California Edison Company (SCE) and the Joint Solar Parties' recommendation the Commission issue a decision by June 2021 ordering this incremental capacity procurement for mid-term needs and accelerating procurement "to address uncertainties around development risk, climate change effects, availability of imports, and other risks."[2] Based on the CAISO's analyses discussed in opening comments, the Commission should, at a minimum, direct procurement of 10,000 MW in

[1] American Clean Power Opening Comments, p. 1; CAISO Opening Comments, p. 1; California Biomass Energy Alliance Opening Comments, p. 2; California Community Choice Association (CalCCA) Opening Comments, p. 5; California Energy Storage Alliance (CESA) Opening Comments, p. 5; Calpine Opening Comments, p.3; Center for Energy Efficiency and Renewable Technology (CEERT) Opening Comments, p. 3; Environmental Defense Fund Opening Comments, p. 1; Form Energy Opening Comments, p. 2; Geothermal Rising Opening Comments, p. 3; GridLiance West Opening Comments, p. 1; Golden State Clean Energy Opening Comments, p. 4; Hydrostor Opening Comments, p. 2; Independent Energy Producers Association Opening Comments, p. 1, Long Duration Energy Storage Association of California Opening Comments, p. 3; Middle River Power (MRP) Opening Comments, p. 6; Ormat Technologies Opening Comments, p. 3; Pacific Gas and Electric (PG&E) Opening Comments, p. 12; Public Advocates Office at the California Public Utilities Commission (Cal Advocates) Opening Comments, p. 3; Shell Energy North America Opening Comments, p. 4; Southern California Edison (SCE) Opening Comments, p. 5; The Utility Reform Network (TURN) Opening Comments, p. 1; Union of Concerned Scientist Opening Comments, p. 1; Vote Solar, the Large-Scale Solar Association, and the Solar Energy Industries Association, collectively, "Joint Solar Parties" Opening Comments, p. 3; and Watson Cogeneration Company Opening Comments, p. 4.

[2] Joint Solar Parties Opening Comments, p. 6; SCE Opening Comments, p. 3;

incremental capacity. As explained in the CAISO's opening comments, the Commission should direct mid-term procurement to be online before 2026, and ideally by mid-2025, because Diablo Canyon will be offline before the end of 2025 and the last of the OTC units in the CAISO footprint are expected to retire by the end of 2023, so the initial tranche of incremental procurement should be online by mid-2023.[3]

The CAISO's stochastic production cost modeling analysis identified the need for 9,100 MW in incremental capacity by 2026 to achieve a 0.1 loss-of-load expectation (LOLE) threshold.[4] The CAISO conducted the production cost modeling analysis based on the 2019 Integrated Energy Policy Report (IEPR) demand forecast, but the 2020 IEPR demand forecast peak is 1,122 MW higher in 2026, which means the system will need over 10,000 MW of new capacity by 2026 to achieve the same 0.1 LOLE.[5] The CAISO's adjustments to Energy Division staff's stack analysis also show the need for 10,000 MW of new capacity by 2026.

However, the larger issue at hand is that the overall need for capacity to meet reliability and state policy goals in the longer-term significantly exceeds the mid-term. In the 46 million metric ton (MMT) greenhouse gas (GHG) emissions target Base Case portfolio transmitted to the CAISO's 2021-2022 Transmission Planning Process, the total capacity of new resources needed by 2031 is 28,303 MW.[6] There is minimal risk for over-procuring, but there is significant risk under-procurement will short-change the Commission's and the CAISO's ability to plan rationally for needed resources.

Several parties expressed reservations regarding Energy Division staff's proposed 20.7% planning reserve margin (PRM) and the need for a stochastic analysis to validate the increased PRM.[7] The CAISO's stochastic analysis indicates a 21.5% to 22.8% PRM is necessary to

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[3] CAISO Opening Comments, p. 9.
[4] CAISO Opening Comments, p. 5. The analysis showed 9,100 MW of need but updating the forecast from IEPR 2019 to IEPR 2020 adds 1,122 MW to the peak. The CAISO therefore recommends 10,000 MW at minimum.
[5] CAISO Opening Comments, p. 7
[6] California Public Utilities Commission, *Decision Transferring Electric Resource Portfolios to the California Independent System Operator for 2021-2022 Transmission Planning Process*, Decision 21-02-008, February 11, 2021, Table 1: Capacity of New Resources Included in TPP Portfolios (in MW), p. 3.
[7] Alliance for Retail Energy Markets Opening Comments, p. 4; California Community Choice Associations (CalCCA) Opening Comments, p. 3; California Environmental Justice Alliance and Sierra Club Opening Comments, p. 17; MRP Opening Comments, p. 6; Natural Resource Defense Council (NRDC) Opening Comments, p.5; PG&E Opening Comments, p. 9; Protect Our Communities Foundation (PCF) Opening Comments, p. 3; San Diego Gas and Electric (SDG&E) Opening Comments, pp. 4-5; SCE Opening Comments, p. 10; and TURN Opening Comments, p. 4.

maintain the 0.1 LOLE in 2026 (*see* Attachment A).[8] The CAISO's analysis demonstrates the need for a PRM well in excess of the current 15% margin to meet existing LOLE standards. On that basis, the Commission should order no less than 10,000 MW of incremental procurement to address mid-term needs.

B. The CAISO Supports the Commission's Efforts to Diversify the Resource Fleet.

The CAISO supports the Commission's efforts to diversify the resource fleet by explicitly including geothermal and long-duration storage resources in its resource plan. The CAISO also recognizes that long-lead time resources may require significant planning and may not be online by 2023 and 2024.[9] However, the Commission should authorize procurement now to start the necessary resource development processes.

Depending on when long-lead time resources can come online, the Commission can deploy a "bridging" strategy, such as procuring dependable imports, as necessary to meet mid-term reliability needs. Parties, including the CAISO, support counting firm imports towards the procurement requirements.[10] The Utility Reform Network (TURN), Center for Energy Efficiency and Renewable Technologies (CEERT), and Middle River Power (MRP) support using the CAISO's proposed resource adequacy import rules in this proceeding.[11] Allowing import procurement consistent with the CAISO's proposed resource adequacy import requirements proposal is necessary because it can effectively address SCE's concerns that a general tightening of generation supply in the west could lead to fewer available imports for California.[12] Because California is import-dependent, less plentiful supply should motivate the Commission to (1) secure imports earlier rather than later and (2) procure higher quality imports sourced from identified sources, delivered on having firm transmission, and having adequate

[8] The PRM range reflects differences in effective load carrying capacity (ELCC) values for wind. Based on the current 15% ELCC value used in the resource adequacy proceeding, the resultant PRM is 21.5%. Based on the 21% ELCC value used in the RESOLVE Model, the resultant PRM is 22.8%.
[9] Eagle Crest Energy Opening Comments, pp. 6-7; Ormat Technologies, Inc, p. 5.
[10] PG&E Opening Comments, p.25; Southwestern Power Group and Pattern Energy Group Opening Comments, p. 6; CAISO Opening Comments, p. 11; PCF Opening Comments, p. 20; Powerex Opening Comments, p.1; and Public Advocates Office at the California Public Utilities Commission (Cal Advocates), p. 22.
[11] CEERT Opening Comments; p.16; MRP Opening Comments, p. 15; and TURN Opening Comments, p. 16.
[12] SCE Opening Comment, p. 28 and *see also* WECC, *August 2020 Heatwave Event Analysis Report*, pp. 10-11. March 19, 2021. Available at: https://www.wecc.org/Reliability/August%202020%20Heatwave%20Event%20Report.pdf?Web=1.

availability to ensure they can serve CAISO load throughout most of the day, seven days a week.[13] Procuring high quality imports can provide a bridging strategy for long-lead time resources and short-term flexibility for load serving entities managing significant in-state resource buildout. Furthermore, high quality imports can help diversify the resource mix over the short-term.

C. The Commission Should Encourage Procurement Consistent with Previously Studied Resource Portfolios.

The CAISO agrees with parties noting transmission planning is important to supporting mid-term procurement and integrating resources to support state policy goals.[14] Joint Solar Parties question "whether the CAISO transmission planning process has anticipated the location of the resources that will be selected by the [load serving entities] LSEs."[15] The CAISO conducts policy-driven transmission planning based on Commission-developed portfolios and additional collaborative efforts amongst Commission, CEC, and CAISO staff to develop busbar mapping. The Commission should encourage load serving entities to procure incremental capacity resources consistent with previously studied portfolios, thereby assuring resources will be deliverable based on the currently planned transmission system.

To the extent load serving entities are seeking resources—for diversity or other reasons—in areas that have not been incorporated in proactive transmission planning activities based on the Commission-provided portfolios, the Commission should provide clarity and correction as early as possible to allow the CAISO to incorporate those changes in its transmission planning process expeditiously.

In a separate but related discussion regarding locational resource need, Pacific Gas and Electric (PG&E) included a zonal need assessment and suggested the Commission target resource procurement located south of Path 26 to ensure system reliability by minimizing congestion.[16] PG&E's analysis does not consider past efforts to study prior Commission-

[13] *See* CAISO's Comments on Track 3B.1 Proposals, *Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Forward Resource Adequacy Procurement Obligations*, R.19-11-009, pp. 7-13, March 12, 2021.
[14] American Clean Power Opening Comments, pp. 3-11; Calpine Opening Comments, p. 8; CEERT Opening Comments, pp. 9-10; Geothermal Rising Opening Comments, pp. 6-7; Joint Solar Parties Opening Comments, pp. 9-10; Ormat Technologies, Inc., pp. 5-8.
[15] Joint Solar Parities, p. 10.
[16] PG&E Opening Comments, pp. 5-7.

developed portfolios and ensure sufficient transmission to provide deliverability consistent with those portfolios. PG&E's analysis may be useful in informing incremental procurement at the margins, but it should not displace the locational mapping efforts included in the Commission-developed portfolios. If load serving entities procure incremental capacity resources that deviate from the Commission-developed and CAISO-studied portfolios, they may trigger a need for additional transmission development to provide deliverability. As a result, the Commission should make best efforts to ensure load serving entities procure incremental capacity consistent with previously studied Commission-developed portfolios.

III. Conclusion

The CAISO appreciates the opportunity to comment and looks forward to working with the Commission and parties in realizing incremental procurement to address critical mid-term reliability needs.

Respectfully submitted

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Attachment A:

Planning Reserve Margin Calculation Based on CAISO Production Cost Modeling

The tables below provide the steps for calculating the planning reserve margin (PRM) for 2026 based on the CAISO's PLEXOS modeling.[17] The CAISO found that the PRM changed depending on the assumption for the wind effective load carrying capability (ELCC) value. When using the 21.0% ELCC value from the RESOLVE ELCC Surface Model pursuant to the Ruling, the resultant PRM is 22.8% for 2026. On the other hand, the current ELCC value used in the resource adequacy program is 15.0% for September, which results in a PRM of 21.5%.[18]

There are two tables each for calculating the 2026 PRM based on the 21.0% and 15.0% wind ELCC values. The two sets of tables are the same except for the difference in the wind ELCC value and the resultant calculations.

Step 1: Calculating discount ratios

The first table in the set provides the discount ratio calculated as the difference between the installed capacity for each resource type in the RESOLVE model and the PRM capacity. The PRM capacity is the ELCC value of the capacity of different types of resources. The resultant discount ratios are shown in column [3].

Step 2: Calculating PRM

The second table in the set calculates the 2026 PRM. In the CAISO's PLEXOS model, resources have rated capacities, as opposed to only the installed capacity. The rated capacity of each resource is the installed capacity adjusted seasonally to reflect the ambient derates for the summer. To calculate the PRM capacity, the discount ratios calculated in Step 1 are applied to the rated capacity. As noted on the table, behind-the-meter photovoltaic (BTMPV) is not included in the calculation because it is already included in the CEC's IEPR demand forecast. Similarly, standalone solar is not included since the peak of the year occurs after sunset.

The sum of all capacities, including wind using either the 21.0% or 15.0% ELCC value, is shown in row [A]. Divided by the peak load results in a PRM of 18.4% based on the portfolio transmitted to the CAISO. However, this portfolio was found not to meet a 0.1 loss of load expectation (LOLE).[19] Based on the CAISO's stochastic analysis, an additional 2,602 MW of effective capacity is needed to achieve a 0.1 LOLE. Assuming this need is met with the specific resource types proposed in the Ruling, the CAISO calculated that 60% of the need can be met with batteries while the remaining 40% can be met by geothermal with the appropriate discount ratio applied. This results in approximately 1,561 MW of physical battery capacity but 1,413 MW of PRM capacity. For geothermal, this results in approximately 1,041 MW of physical capacity but 641 MW of PRM capacity. The resultant PRM is shown in row [G].

[17] For discussion and methodology description of CAISO's PLEXOS modeling, *see* CAISO, Attachment A to Comments of the California Independent System Operator Corporation, R.20-05-003, October 23, 2020.
[18] Decision 19-06-026, June 27, 2019, p. A-1.
[19] CAISO Opening Comments, p. 5.

2026 PRM Based on 21.0% Wind ELCC

Step 1: Calculating discount ratios

RESOLVE installed capacity and PRM contribution (46 MMT portfolio, source: *RESOLVE_TPP_PUBLIC_RELEASE_2020_12_10.zip*)

Installed Capacity (MW)		PRM Capacity (MW, discounted)		Discount Ratios
	2026		2026	2026
	[1]		[2]	[3]
				([2]/[1])
BTM PV	-		-	
Gas	25,113	CCGT	15,454	94.7%
CHP	2,296	CHP	1,456	63.4%
		Peaker	8,334	*(included in CCGT)*
Shed DR	2,803	Shed DR	2,803	100.0%
Hydro (Large)	7,070	Hydro (small + large)	5,645	70.2%
Hydro (Small)	974			
Pumped Storage	2,227	Pumped Storage	2,227	100.0%
Biomass	903	Biomass	630	69.8%
Geothermal	1,851	Geothermal	1,140	61.6%
Variable Renewable ELCC (Incl. BTM PV)	10,125	Variable Renewable ELCC (Incl. BTM)	2,126	21.0%
Battery Storage	10,279	Battery (incl. BTM)	9,301	90.5%
	63,641		**49,116**	
	5,000	Import Capacity	5,000	100.0%
Sum	**68,641**	**Sum**	**54,116**	78.8%

Wind	*10,125*
Wind OOS New Tx	-
Solar	-
Customer Solar	-
Sum	*10,125*

Step 2: Calculating PRM

PLEXOS Model PRM Calculation

		Rated Capacity (MW)	PRM Capacity (MW)
		2026	2026
*	BTMPV	-	-
	CCGT	15,767	14,935
	Cogen	2,299	1,458
	CT	8,582	8,129
	DR	2,729	2,729
	Hydro	7,070	4,961
	ICE	255	242
	PS-Hydro	2,284	2,284
	Biomass	901	629
	Geothermal	1,851	1,140
	Small Hydro	974	683
**	Solar	-	-
	Wind	10,125	2,126
	Battery	9,546	8,638
	Total Capacity	**62,384**	**47,954**
	Import	6,500	6,500
[A]	**Sum**	**68,884**	**54,454**

PRM of the 46 MMT portfolio (does not meet 0.1 LOLE)
(Based on 2019 IEPR hourly Managed Load forecast)

[B]	Peak Managed Load (HE19 PDT, HE20 PST)	46,011
[C]	PRM [A]/[B] - 1	18.4%

PRM with additional effective capacity identified by CAISO production cost modeling to achieve 0.1 LOLE

[D]	Identified capacity shortfall (MW)	2,602
	PRM capacity of the additional capacity	
[E]	Battery (60% of [D] * discount ratio)	1,413
[F]	Geothermal (40% of [D] * discount ratio)	641
[G]	PRM ([A] + [E] + [F])/[B] - 1	22.8%
	(Based on wind ELCC of 21.0%)	

* BTMPV - Not include because already included in IEPR forecast.

** Solar - Assumed to be standalone. Not included because peak occurs after sunset.

2026 PRM Based on 15.0% Wind ELCC

Step 1: Calculating discount ratios

RESOLVE installed capacity and PRM contribution (46 MMT portfolio, source: *RESOLVE_TPP_PUBLIC_RELEASE_2020_12_10.zip*)

Installed Capacity (MW)		PRM Capacity (MW, discounted)		Discount Ratios
	2026		2026	2026
	[1]		[2]	[3]
				([2]/[1])
BTM PV	-		-	
Gas	25,113	CCGT	15,454	94.7%
CHP	2,296	CHP	1,456	63.4%
		Peaker	8,334	*(included in CCGT)*
Shed DR	2,803	Shed DR	2,803	100.0%
Hydro (Large)	7,070	Hydro (small + large)	5,645	70.2%
Hydro (Small)	974			
Pumped Storage	2,227	Pumped Storage	2,227	100.0%
Biomass	903	Biomass	630	69.8%
Geothermal	1,851	Geothermal	1,140	61.6%
Variable Renewable ELCC (Incl. BTM PV)	10,125	Variable Renewable ELCC (Incl. BTM)	1,519	15.0%
Battery Storage	10,279	Battery (incl. BTM)	9,301	90.5%
	63,641		**48,508**	
	5,000	Import Capacity	5,000	100.0%
Sum	**68,641**	**Sum**	**53,508**	78.0%

Wind	*10,125*
Wind OOS New Tx	-
Solar	-
Customer Solar	-
Sum	*10,125*

Step 2: Calculating PRM

PLEXOS Model PRM Calculation

		Rated Capacity (MW)	PRM Capacity (MW)
		2026	2026
*	BTMPV	-	-
	CCGT	15,767	14,935
	Cogen	2,299	1,458
	CT	8,582	8,129
	DR	2,729	2,729
	Hydro	7,070	4,961
	ICE	255	242
	PS-Hydro	2,284	2,284
	Biomass	901	629
	Geothermal	1,851	1,140
	Small Hydro	974	683
**	Solar	-	-
	Wind	10,125	1,519
	Battery	9,546	8,638
	Total Capacity	**62,384**	**47,347**
	Import	6,500	6,500
[A]	**Sum**	**68,884**	**53,847**

PRM of the 46 MMT portfolio (does not meet 0.1 LOLE)

(Based on 2019 IEPR hourly Managed Load forecast)

[B]	Peak Managed Load (HE19 PDT, HE20 PST)	46,011
[C]	PRM [A]/[B] - 1	17.0%

PRM with additional effective capacity identified by CAISO production cost modeling to achieve 0.1 LOLE

[D]	Identified capacity shortfall (MW)	2,602
	PRM capacity of the additional capacity	
[E]	Battery (60% of [D] * discount ratio)	1,413
[F]	Geothermal (40% of [D] * discount ratio)	641
[G]	PRM ([A] + [E] + [F])/[B] - 1	21.5%
	(Based on wind ELCC of 15.0%)	

* BTMPV - Not include because already included in IEPR forecast.

** Solar - Assumed to be standalone. Not included because peak occurs after sunset.