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IN THE MATTER OF: *California Offshore Renewable Energy*	DOCKET NO. 17-MISC-01 RE: Offshore Renewable Energy

Comments of Anbaric Development Partners on the
Draft Permitting Roadmap for Offshore Wind

On behalf of Anbaric Development Partners, LLC ("Anbaric"), we are pleased to provide the following comments in response to the AB 525 Draft Conceptual Permitting Roadmap for Offshore Wind Energy Facilities Originating in Federal Waters off the Coast of California ("Draft Permitting Roadmap"). These comments supplement Anbaric's oral comments offered at the November 19, 2022 workshop on Developing a Permitting Roadmap for Offshore Wind Energy Development Off the Coast of California.

Anbaric develops transmission systems to accelerate the deployment of renewable energy across North America. Anbaric specializes in the design, development, financing, and construction of large-scale electric transmission systems. As California transitions to a clean energy future, significant investments in transmission will be necessary to ensure that renewable energy resources reach markets. It is, therefore, essential that the AB 525 permitting roadmap anticipate and support the development of transmission systems needed to support California's offshore wind generation goal of 25 GW by 2045.

I. THE PRMITTING ROADMAP SCOPE SHOULD INCLUDE SUBSEA TRANSMISSION PROPOSED INDEPENDENTLY OF WIND ENERGY PROJECTS.

The Draft Permitting Roadmap envisions memoranda of understanding, or similar agreements, among the relevant federal, state, and local agencies to coordinate environmental reviews and permitting for offshore wind. Anbaric supports the interagency agreement model, as it has the potential to provide certainty to industry and yield targeted and high quality data to inform agency decision-making and the public.

However, Anbaric is concerned that the Draft Roadmap and the forthcoming inter-agency agreements are proposed to be limited to wind energy facilities and transmission facilities proposed only as part of a wind energy project. (See Draft Permitting Roadmap, at p. 3 ["The conceptual permitting roadmap presented in this document is intended to apply only to permitting processes for transmission that would be evaluated <u>as part of offshore wind energy developments</u> …"], Emphasis added.) This limitation does not exist in AB 525, and should not be created by the AB 525 permitting roadmap.

There is no doubt that the Commission has the discretion to include in the permitting roadmap subsea transmission proposed independently of a wind energy facility. (See Pub. Resources Code, §§ 25991.5 ["The commission shall develop and produce a permitting roadmap that describes timeframes and milestones for a <u>coordinated, comprehensive, and efficient permitting process</u> for offshore wind energy facilities <u>and associated electricity and transmission infrastructure off the coast of California</u>." Emphasis added; see also Pub. Resources Code, § 25991, subd. (c)(3) ["[T]he strategic plan shall include, <u>at a minimum</u>, [necessary subsea transmission investments and permitting]." Emphasis added; § 25991.4 [The commission … shall assess the transmission investments and upgrades necessary, <u>including potential</u>

subsea transmission options, to support the 2030 and 2045 offshore wind planning goals ….” Emphasis added.)

Subsea transmission options are being studied by the California Public Utilities Commission (“CPUC”) and the California Independent System Operator (“CAISO”). The CPUC Staff Report on the Modeling Assumptions for the 2023-2024 Transmission Planning Process acknowledges that both overland and subsea transmission options would “likely be cost-effective” based on cost estimates.[1] Additionally, the CPUC’s Proposed Decision (PD) in the pending Integrated Resource Planning rulemaking, acknowledges:

> [R]recent results of the lease auctions for offshore wind resources show interest in the Humboldt area and support our assessment that we need transmission development in the area to commence soon. In addition, the Humboldt resource area will likely require longer development timelines compared to transmission development on the central coast, thus making it important to study, and with its inclusion in the base case portfolio, potentially be approved for development, sooner rather than later . . . . “[M]ore offshore wind is likely to be needed in the long run [and should be addressed in the] CAISO’s 20-year transmission outlook and/or future TPP cycle sensitivity cases for more refined study of offshore wind, as its development progresses.[2]

The Commission should include independently advanced subsea transmission facilities in the Permitting Roadmap to stay in step with the CPUC and the CAISO transmission planning assumptions and to support California’s offshore wind generation goals.

Including independently advanced subsea transmission facilities within the scope of the Permitting Roadmap makes sense. Specifically, all of the same agencies involved in reviewing and issuing approvals to wind energy facilities would also be involved in reviewing and siting high-voltage subsea transmission infrastructure. The permitting of transmission facilities in California is a multi-year and costly undertaking. The Commission should allow independently advanced transmission projects designed to deliver offshore wind to benefit from the inter-agency coordination and permitting efficiencies of the Conceptual Permitting Roadmap.

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[1] CPUC, Modeling Assumptions for the 2023-2024 Transmission Planning Process, Jan. 2023, p. 36, attached here to as **Attachment 1**.

[2] Order Instituting Rulemaking, Proposed Decision Ordering Supplemental Mid-term Reliability Procurement (2026-2027) and Transmitting Electric Resource Portfolios to California Independent System Operator for 2023-2024 Transmission Planning Process, Jan. 13, 2023, at pp. 48-49, 55-56, attached hereto as **Attachment 2**.

II. THE PERMITTING ROADMAP SHOULD NOT PREMATURELTY PRECLUDE INTERCONNECTION ALTERANTIVES.

Anbaric is also concerned with the assumption, made in the Draft Permitting Roadmap, that the first point of interconnection for a wind energy facility would be on land. (See Draft Permitting Roadmap, p. 3.) This assumption eliminates more efficient transmission alternatives, such as mesh grid systems,[3] and is inconsistent with the Commission's obligation to study and address cost-effective, high-voltage subsea transmission options in the Strategic Plan. (See Pub. Resources Code, § 25991.4. subd. (a); Stats 2021 ch. 231, § subd. (h).) The Commission should not prematurely assume that the first point of interconnection for an energy facility would be on land.

III. CONCLUSION.

For the above reasons, we urge the Commission to clarify in the Permitting Roadmap that the forthcoming inter-agency agreements should address subsea transmission options and mesh systems, proposed both as part of **and independently of** wind energy facilities. The Commission should also make clear in the Permitting Roadmap that it is continuing to evaluate transmission interconnection alternatives that may reduce cable miles and onshore interconnection points and promote the modular, phased development of subsea high voltage transmission systems.

Respectfully,

Elizabeth Klebaner

[3] For a detailed discussion of mesh grid systems, please refer to Anbaric's December 1, 2022 Comments in response to the November 10, 2022 Workshop on Assessing Transmission Upgrades and Investments for Offshore Wind Development off the Coast of California, submitted into the Commission's Transmission for Offshore Wind docket.

ATTACHMENT “1”

Modeling Assumptions for the 2023-2024 Transmission Planning Process

CPUC Staff Report

January 2023

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1. Document Purpose

Resource-to-busbar mapping ("busbar mapping") is the process of refining the geographically coarse electricity resource portfolios produced in the California Public Utilities Commission's (CPUC) Integrated Resource Plan (IRP) proceeding, into plausible network modeling locations for transmission analysis in the California Independent System Operator's (CAISO) annual Transmission Planning Process (TPP).

The purpose of this Report is to memorialize and communicate the methodology and results of the busbar mapping process performed by the CPUC, CAISO and California Energy Commission (CEC), for input into the 2023-2024 TPP, providing transparency and opportunity for IRP and TPP stakeholder engagement.

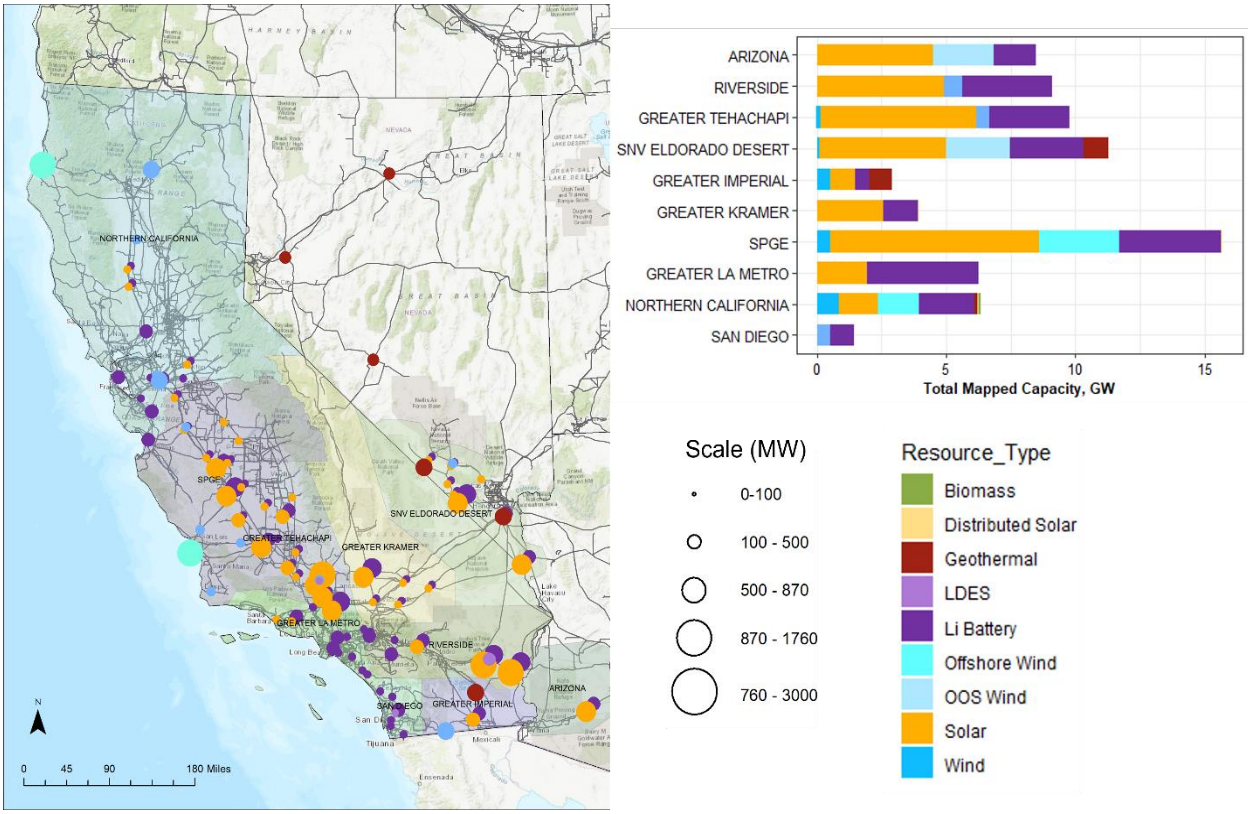
Similar to preparation for previous two TPPs, this Report includes the key guidance for TPP studies that in past years was conveyed in the "Long-Term Procurement Plan Assumptions and Scenarios" and later the "Unified Inputs and Assumptions", thus superseding earlier guidance and documents.

The approach taken in this Report serves to provide detailed documentation to accompany several Excel workbooks that identify the locations for future generation and storage resources that are expected to be necessary to support the California electric grid. Please see Section 10: Appendices for links to these workbooks:

1. Methodology for Resource-to-Busbar Mapping & Assumption for the TPP
2. Busbar Mapping Dashboard workbooks for base case portfolio's 2033 and 2035 model year mappings.
3. 2022 IRP Baseline Reconciliation for online and in-development resources
4. Retirement List of Thermal Generation Units

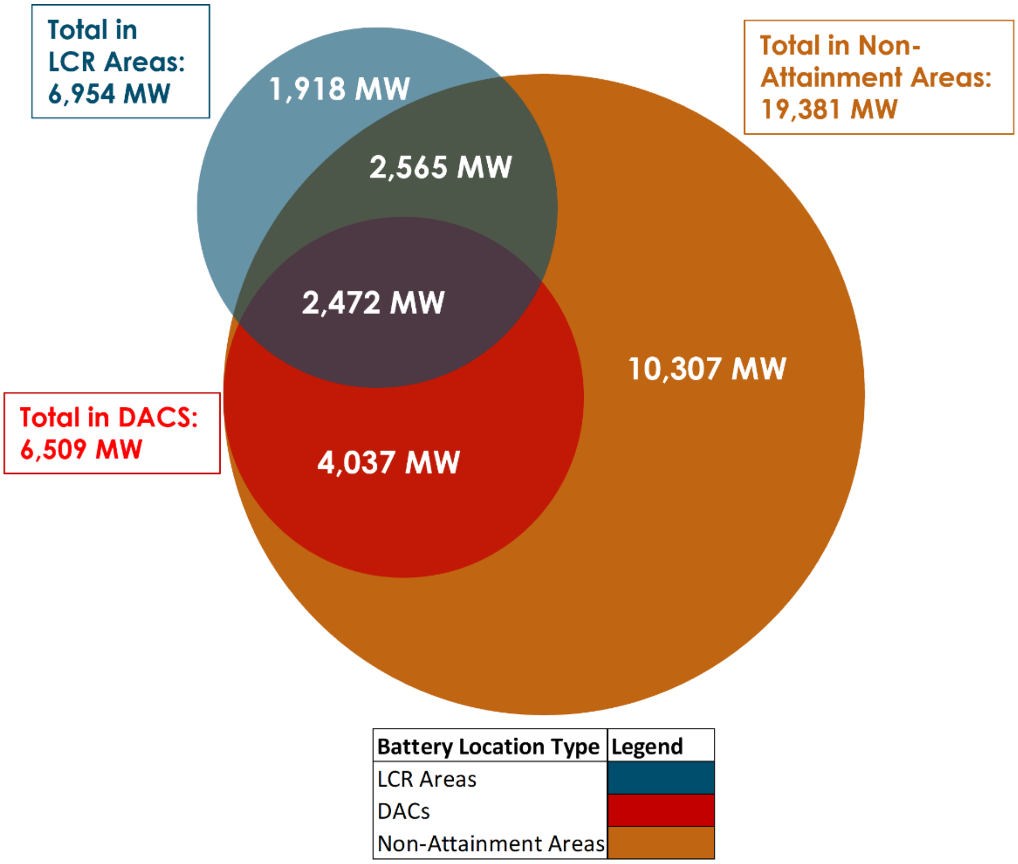
Figure 1 below includes a table and a graph which provide an overview of the composition of the mapped results for base case portfolio's 2035 model year as well as a visual map-based representation that conveys the mapped resources, one of the primary inputs being transmitted by the CPUC to the CAISO for the 2023-2024 TPP, in an easily digestible manner. The map provides an overview of the results of the implementation of the busbar mapping process. These results, as well as the inputs, methodology, and analysis are described in detail in the following sections of this Report.

Figure 1: Final busbar mapping results of the proposed base case portfolio for 2035. (Left) Map of the final busbar mapping results show the location and amount of resources mapped by resource type. (Right) Plot show the total mapped capacity broken down by region.



With 21,740 MW of battery storage capacity mapped to busbars in 2033 and 28,370 MW mapped in 2035 for the 2023-2024 TPP base case portfolio, battery storage will continue to play an important role in California's ability to meet policy goals, and in CAISO's transmission planning process. The battery storage capacity was mapped using the established methodology which takes into consideration policy goals as one of multiple factors. Figure 2 below shows a subset of the total storage resources mapped for the 2035 portfolio and depicts the degree to which staff was able to map the storage to various prioritized locations including local capacity requirement (LCR) areas, Disadvantaged Communities (DACs), and air-quality non-attainment areas.

Figure 2 Locationally mapped battery storage alignment for three of the battery mapping policy objectives[1].



[1] As defined in the Busbar Mapping Methodology. See Appendix A.

2. Scope

This Report addresses the busbar mapping and other modeling assumptions for the portfolios being transmitted by the CPUC to the CAISO for the 2023-2024 TPP, as outlined in Table 1 below. This report contains only the mapping results for the 30 MMT base case portfolio using the 2021 IEPR Additional Transportation Electrification (ATE) load scenario. CPUC staff will release a supplemental report in February 2023 for the offshore wind sensitivity Portfolio.

Table 1: Modeling assumptions reported in this document.

IRP Portfolio	**2023-2024 TPP Portfolio Use Case(s)**	**Modeling Assumptions**
30 MMT base case portfolio using the 2021 IEPR[2] Additional Transportation Electrification (ATE) load scenario (30 MMT with ATE portfolio)	• Reliability base case • Policy-driven base case assessment • Economic assessments	• Busbar allocations of non-battery resources and battery resources for 2033 and 2035 model years • New baseline resources identified since the February 2020 baseline transmitted for the 2020-2021 TPP. • Demand response assumptions • Thermal generation RESOLVE input assumptions
30 MMT offshore wind sensitivity portfolio using the 2021 IEPR ATE with 13.4 GW of offshore wind in 2035 (Offshore wind sensitivity portfolio)	• Policy-driven sensitivity assessment	• Busbar allocations of non-battery resources and battery resources for the 2035 model year • New baseline resources. • Demand response assumptions • Thermal generation RESOLVE input assumptions

[2] Referring to the Integrated Energy Policy Report (IEPR) prepared by the California Energy Commission.

3. Report Summary

The October 7, 2022, Ruling Seeking Comments on Portfolios to be used in the 2023-2024 TPP[3] proposed the 30 MMT portfolio with the 2021 IEPR Additional Transportation Electrification (ATE) load scenario as the reliability and policy-driven base case portfolio for the 2023-2024 TPP. The ruling proposed mapping and transmitting two study years: 2033 and 2035 for this base case portfolio. The ruling also proposed transmitting two policy-driven sensitivity portfolios: an offshore wind portfolio centered on the development of 13.4 GW of offshore wind by 2035 and a limited offshore and out-of-state (OOS) wind development portfolio designed to study an alternative resource mix more reliant on solar, storage, and geothermal. Based on party comments, the decision was made to not include the second, limited offshore and OOS wind sensitivity portfolio.

The busbar mapping work was conducted by staff taking into consideration parties' comments on the busbar mapping methodology. This Report describes the base case portfolio, its mapping to specific busbars, as well as additional inputs and assumptions for the CAISO's 2023-2024 TPP. CPUC staff intended to release the mapping results for the offshore wind sensitivity portfolio in a supplement document in February 2023.

This Report is structured as follows:

Section 4 states the objectives of studying the base case portfolio and details the inputs CPUC staff provided to the mapping process.

Section 5 summarizes the updates made to the proposed methodology[4] used by CPUC, CAISO and CEC staff to conduct busbar mapping and produce other inputs and assumptions for the 2023-2024 TPP.

Section 6 details the analysis and steps taken by staff to improve the mapping allocations in order to meet the criteria.

Section 6.2.B summarizes the final results of the mapping process.

Section 8 presents other information about the portfolio that is required for TPP.

Section 9 draws conclusions regarding mapping the base case portfolio for the 2023-2024 TPP and provides guidance to the CAISO.

[3] https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=497509406

[4] Referring to the version attached to the 10/07/22 Ruling. Available at https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/2023-2024-tpp-portfolios-and-modeling-assumptions/busbar-mapping-methodology-for-the-tppv20221005.pdf

4. Inputs

In order to the complete the steps in the methodology described below, the following input is needed: Portfolios of selected resources for 2033 and 2035 by RESOLVE resource area, with Fully Deliverable (FD) and Energy-Only (EO) megawatt (MW) amounts specified.

The base case portfolio described in Section 4.2 was developed using similar modeling assumptions as the 2022-2023 TPP 30 MMT High Electrification Sensitivity Portfolio. The following additional updates were made since the 2022-2023 TPP base case portfolio transmitted to the CAISO in February 2022:[5]

- Updated the resource costs to the NREL 2021 ATB and Lazard LCOS 7.0
- Updated the load forecast to the CEC 2021 IEPR
    - The Base and Sensitivity portfolios all use the 2021 IEPR Additional Transportation Electrification load scenario.
- Updated the existing and planned resources to reflect updates to capacity and retirements of existing plants, "in-development" resources that have newly come online, and new "in-development" resources, improving alignment with LSE Resource Data Templates as of August 2022.
- Updated transmission deliverability-resource mappings, existing transmission deliverability capacity, and transmission upgrade costs using the CAISO 2021-2022 TPP results.
- Updated the secondary system need (SSN) transmission utilization for battery storage resources to be in line with latest CAISO assumptions:
    - 50% transmission capacity utilization in on-peak SSN timeframe.

4.1 Reconciling New Baseline Resources

Since the previous busbar mapping cycles, new resources have been added to the baseline, the master array of resources online, under-construction, or contracted and assumed to be operational in the years modeled. These new resources need to be reconciled to ensure they are properly accounted for in busbar mapping and the transmission planning process. The previous RESOLVE baseline for TPP was set in February 2020 and was included as part of the 2020-2021 TPP portfolio transmittal to the CAISO. The CAISO utilized this baseline set to develop the updated transmission capacities in the CAISO's White Paper – 2021 Transmission Capability Estimates for use in the CPUC's Resource Planning Process (CAISO's 2021 White Paper),[6] which the CPUC utilized in both the RESOLVE model used to develop the portfolio and in the busbar mapping process. The new baseline resources need to be accounted for in both the portfolio creation and the transmission deliverability information.

Since the development of the February 2020 baseline, Load Serving Entities (LSEs) have submitted two sets of integrated resource plans and procurement compliance filings to the CPUC pursuant to D.19-11-016, D.20-12-044, and D.21-06-035 that identified new resources coming online or being

[5] Details on the 2022-2023 TPP base case portfolio and the RESOLVE model version used to develop it can be found at the CPUC webpage: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2019-20-irp-events-and-materials

[6] Revised White Paper – 2021 Transmission Capability Estimates for use in the CPUC's Resource Planning Process (10/28/2021).

developed, which LSEs have procured but are not in the 2020-2021 TPP baseline. CPUC staff fully incorporated new resources contracted by LSEs identified from the September 2020 integrated resource plans and procurement compliance filings submitted through September 2022. Staff also partially utilized the recently submitted November 2022 integrated resource plans to verify new resources and identify additional contracted resources. Given the timing of the busbar mapping effort, staff were not able to fully incorporate the plans November 2022 IRP plans. Additionally, CPUC staff reached out to major Participating Transmission Owners (PTOs) within the CAISO's balancing authority area (BAA) to review the identified resources in their regions and to identify any additional under-construction resources that ought to be included for study in the TPP.

These new online, under-construction, and contracted resources need to be accounted for by the CPUC in busbar mapping and by the CAISO in the transmission planning process to ensure their transmission capability utilization is accurately captured in planning. The steps below describe with reference to the 30 MMT with ATE base case portfolio how these new resources were incorporated in the mapping process:**Error! Reference source not found.**

- The new resources identified through the reconciliation process were aggregated into online resources and in-development resources, which are either under-construction as identified by the PTOs or under-contract by LSEs.
- In developing the RESOLVE portfolio, rather than utilizing the updated baseline, staff accounted for these new baseline resources in the portfolio by forcing the RESOLVE model to include as "planned" resources in its portfolio the amount of each resource type. This ensured that RESOLVE reserved the transmission headroom that these new baseline resources require. In previous busbar mapping cycles, baseline resources were subtracted from the selected portfolios because they were not accounted for in the RESOLVE "planned" set of resources.
- In the busbar mapping process, staff then reconcile the new baseline resources by specifically mapping planned resources selected by RESOLVE to match the locations of the new baseline resources. Online resources were only accounted for in the transmission calculations analysis, while the in-development resources were included with the generic resources in all busbar mapping analysis. (NOTE: Additional resources were identified as online or in-development by CPUC staff after the initial RESOLVE portfolios were developed. Rather than rerunning the portfolios with additional "planned" resources, staff shifted RESOLVE identified generic resources to be classified as in-development or online resources in the mapping process. Thus, while the breakdown of "planned" versus generic resources changed, the total MW number of resources does not.)

Reconciled resources identified as solar-storage hybrids were split into individual battery, fully deliverable (FCDS) solar and energy only deliverability status (EODS) solar components based on the max MW output and the known deliverability status of the resource to maintain consistency with the implementation and treatment of co-located solar and storage in the busbar mapping process.

The baseline reconciliation process identified a total of nearly 28,100 MW of newly online, under-construction, or contracted resources not previously included in the 2020-2021 TPP baseline list. Of that amount nearly 8,200 MW were identified as online as of August 1, 2022, while the remaining 19,900 MW are contracted or under construction resources. Table 2 breaks down those resources by resource type and online or in-development status. A detailed summary by substation of new online and in-development resources is included in Appendix D. Some resources identified as online or in-development interconnect to lower voltage substations or substations not included in the system level substation list utilized in busbar mapping. As a rough approximation, these resources were mapped to the nearest, transmission connection-wise, substation included in busbar mapping analysis list. For out-of-state resource or out-of-CAISO resources, staff sought to identify and map them to their point of interconnection with the CAISO transmission system.

Table 2: Summary of newly identified online and in-development resources not previously in the 20-21 TPP baseline by resource type and MW amount.

Reconciled Resources (MW)	Battery	Solar	Wind	Geothermal	Biomass	Total
Online	3,796	3,071	1,273	40	6	**8,186**
In-Development	11,885	7,612	178	205	16	**19,897**

4.2 30 MMT with Additional Transportation Electrification Base Case Portfolio

Objective and Rationale

The objective of transmitting this portfolio to the CAISO for the TPP base case studies is to ensure that transmission planning and development aligns with resource planning and development. The design of this portfolio achieves this objective by reflecting a possible lowest-cost achievement of the state's greenhouse gas reduction goals as informed by individual LSE planning efforts, staff aggregation of these plans, and IRP capacity expansion modeling. This 30 MMT with 2021 IEPR Additional Transportation Electrification (ATE) portfolio is designed around that 2030 GHG target and is named based on the convention of referring to that target. However, because the resource planning horizon needed specifically for the 2023-2024 TPP extends to 2035, the emissions of the portfolio in 2033 and 2035 are lower than 30 MMT. This is described in more detail under the Description of Portfolio section below. The 2021 IEPR ATE load scenario utilized in the portfolio is designed to reflect a higher electrification future, centered on recent CARB electrification regulations on vehicles, and assess the potential transmission impacts and transmission upgrade needs of new policy drivers pointing to higher electrification loads.

To improve the degree of accuracy of the transmission upgrade information that comes out of the RESOLVE analysis, the CPUC updated the modeling of transmission deliverability using data from the CAISO's 2021 White Paper and supplementing it with data from CAISO's 2021-2022 TPP results. This update further improved the locational information for battery resources modeled in RESOLVE and the ability to select them in the same transmission constraints as solar resources. Ultimately, this resulted in improved information as inputs for the busbar mapping process for assigning co-located solar and battery resources.

However, one of the challenges that persisted with the updated transmission information from the CAISO is a disconnect with the transmission information that was used in developing the LSE plans. To incorporate both the LSE plans and the new transmission deliverability data, some modifications were made to assumptions of resources that could be selected to levels contained in the LSEs' plans. For instance, although offshore wind from the Humboldt area is contained in the LSE plans, the RESOLVE portfolio was allowed to use offshore wind from Morro Bay as a replacement option. This was done to enable the model to solve, because the amount of available transmission deliverability at Humboldt was less than the amount of resource contained in the LSE plans. In addition, the lack of information on the cost and timing of additional upgrades at Humboldt would make the model unable to solve, without the above adjustment to the assumptions; because it would not be able to meet the constraint even at a higher cost.

Relationship Between RESOLVE Selected Resources and the CAISO TPP

RESOLVE is a system level capacity expansion model with simplified transmission capability and cost assumptions. As an input to the busbar mapping process the resources selected by RESOLVE and their locations get evaluated based on interconnection feasibility, potential required transmission upgrades, and other criteria. The RESOLVE portfolio for this 2023-2024 TPP indicates the need for 4,041 MW of partial or full transmission upgrades by 2033 and 9,531 MW by 2035 to accommodate the full number of resources selected in 2033 and 2035 that could not be accommodated by the existing transmission system.

However, CPUC staff cannot know for certain the transmission implications until they are studied by the CAISO in the TPP at actual busbar locations. For this reason, the CPUC will transmit this portfolio to the CAISO to conduct detailed transmission planning to assess the exact transmission needs. CAISO TPP results will indicate whether any reliability or policy-driven transmission upgrades are found necessary, and if so, those transmission upgrades may be recommended to the CAISO Board of Governors for approval.

If any of the approved transmission upgrades are investments made specifically to accommodate the resource development future reflected by the CPUC in this portfolio, this portfolio will have helped ensure that transmission and generation resources are developed concurrently. This should minimize risk of stranded generation assets later being discovered to be undeliverable to load due to a lack of available transmission capability.

To ensure this is a bidirectional minimization of ratepayer costs, the CPUC expects to receive information from the CAISO regarding which approved transmission projects are developed to accommodate policy-driven resource planning. (Typically, the CAISO Transmission Plan clearly identifies the policy-driven projects). The CPUC can then act accordingly to encourage the development of those resources that can utilize the transmission capacity to avoid stranded transmission assets. Further, the CPUC's transmittal cannot be assumed to prejudge the outcome of a future siting Application for a specific transmission line (e.g. a Certificate of Public Convenience and Necessity Proceeding). However, the CPUC's transmittal of resource planning assumptions can be considered in the need determination phase of the CPUC's consideration of any specifically proposed transmission project.

Description of Portfolio

For the planning years 2033, the portfolio comprises 21,738 MW of new battery storage, 1,524 MW of long-duration storage in the form of pumped hydro storage, 41,148 MW of new in-state renewable resources (which includes 3,261 MW of offshore wind), and 4,828 MW of new out-of-state (OOS) wind resources on new OOS transmission, among other resources. For the planning years 2035, the portfolio comprises 28,381 MW of new battery storage, 2,000 MW of long-duration storage in the form of pumped hydro storage, 49,641 MW of new in-state renewable resources (which includes 4,707 MW of offshore wind), and 4,828 MW of new out-of-state (OOS) wind resources on new OOS transmission, among other resources.[7]

Table 3 summarizes the resource build out in 2033 and 2035, the resource planning years needed specifically for the 2023-2024 TPP. The GHG targets modeled in 2033 and 2035 were 27 MMT and 25 MMT respectively.[8]

Table 3. Capacity Additions in 2033 in the 30 MMT with ATE Base Case Portfolio

30 MMT 2021 Additional Transportation Electrification (2033 and 2035 Results)			
	Unit	**2033**	**2035**
Gas	MW	0	128
Biomass	MW	134	134
Geothermal	MW	1,863	1,863
Hydro (Small)	MW	-	-
Wind	MW	3,864	3,864
Wind OOS New Tx	MW	4,828	4,828
Offshore Wind	MW	3,261	4,707
Solar	MW	32,025	39,072
Customer Solar	MW	-	-
Battery Storage	MW	21,738	28,381
Pumped Storage	MW	1,524	2,000
Shed DR	MW	1,111	1,111
Gas Capacity Not Retained	MW	-	-
In-State Renewables	MW	**41,148**	**49,641**
Out-of-State Renewables	MW	**4,828**	**4,828**

This portfolio meets the RESOLVE 22.5% Planning Reserve Margin (PRM) constraint which includes the adjustments made to incorporate the mid-term reliability decision (D.21-06-035) requirements. The loss of load expectation (LOLE) study results include a 0.001 LOLE in 2026, a 0.002 LOLE in 2033, and a 0.022 LOLE in 2035, indicating that this is a reliable portfolio. The resource inputs to the mapping process for this portfolio are summarized in **Error! Reference source not found.** below.

[7] Full RESOLVE results can be found on the CPUC's Portfolios and Modeling Assumptions for the 2023-2024 Transmission Planning Process website: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

[8] This represents the CAISO contribution extrapolated from a 38 MMT by 2030 target using the same assumptions that were used for incorporating post-2030 years into select modeling runs to reflect achievement of the Senate Bill (SB) 100 (DeLeón, 2018) 2045 goals in the development of the 2021-2022 TPP.

Table 4: All resources selected in the 30 MMT with ATE portfolio (2033 and 2035 cumulative)

Pre Round 1 - RESOLVE selections	2033 Selected Resources			2035 Selected Resources		
Resource	**2033 FD MW**	**2033 EO MW**	**2033 Total MW**	**2035 FD MW**	**2035 EO MW**	**2035 Total MW**
Solano_Geothermal	135	-	135	135	-	135
Northern_California_Geothermal	-	-	-	-	-	-
Inyokern_North_Kramer_Geothermal	24	-	24	24	-	24
Southern_Nevada_Geothermal	320	-	320	320	-	320
Greater_Imperial_Geothermal	640	744	1,384	640	744	1,384
Greater_LA_Solar	-	3,000	3,000	-	3,000	3,000
Northern_California_Solar	-	-	-	-	-	-
Southern_PGAE_Solar	-	4,751	4,751	-	11,279	11,279
Tehachapi_Solar	-	6,289	6,289	-	6,289	6,289
Greater_Kramer_Solar	-	5,360	5,360	-	5,360	5,360
Southern_NV_Eldorado_Solar	-	7,644	7,644	-	8,163	8,163
Riverside_Solar	-	4,003	4,003	-	4,003	4,003
Arizona_Solar	-	160	160	-	160	160
Imperial_Solar	-	693	693	-	693	693
Northern_California_Wind	-	866	866	-	866	866
Solano_Wind	-	560	560	-	560	560
Humboldt_Wind	-	34	34	-	34	34
NW_Ext_Tx_Wind	-	67	67	-	67	67
Kern_Greater_Carrizo_Wind	60	-	60	60	-	60
Carrizo_Wind	-	287	287	-	287	287
Central_Valley_North_Los_Banos_Wind	173	-	173	173	-	173
Tehachapi_Wind	-	275	275	-	275	275
Southern_Nevada_Wind	-	442	442	-	442	442
Wyoming_Wind	2,328	-	2,328	2,328	-	2,328
Riverside_Palm_Springs_Wind	-	-	-	-	-	-
New_Mexico_Wind	2,500	-	2,500	2,500	-	2,500
SW_Ext_Tx_Wind	-	500	500	-	500	500
Baja_California_Wind	600	-	600	600	-	600
Diablo_Canyon_Offshore_Wind	-	-	-	-	-	-
Morro_Bay_Offshore_Wind	3,100	-	3,100	3,100	-	3,100
Humboldt_Bay_Offshore_Wind	161	-	161	1,607	-	1,607
Cape_Mendocino_Offshore_Wind	-	-	-	-	-	-
Sub Total - Renewables	**10,042**	**35,675**	**45,717**	**11,487**	**42,722**	**54,210**
Greater_LA_Li_Battery	5,347	-	5,347	6,741	-	6,741
Northern_California_Li_Battery	319	-	319	319	-	319
Southern_PGAE_Li_Battery	5,690	-	5,690	7,730	-	7,730
Tehachapi_Li_Battery	3,530	-	3,530	6,240	-	6,240
Greater_Kramer_Li_Battery	2,532	-	2,532	2,532	-	2,532
Southern_NV_Eldorado_Li_Battery	3,040	-	3,040	3,440	-	3,440
Riverside_Li_Battery	617	-	617	617	-	617
Arizona_Li_Battery	0	-	0	0	-	0
Imperial_Li_Battery	-	-	-	-	-	-
San_Diego_Li_Battery	655	-	655	754	-	754
Riverside_West_Pumped_Storage	413	-	413	500	-	500
Tehachapi_Pumped_Storage	500	-	500	500	-	500
Riverside_East_Pumped_Storage	500	-	500	500	-	500
San_Diego_Pumped_Storage	111	-	111	500	-	500
CAISO_New_BTM_Li_Battery	8	-	8	8	-	8
Sub Total - Energy Storage	**23,262**	**-**	**23,262**	**30,381**	**-**	**30,381**

In addition to the resource selection information from RESOLVE, transmission upgrade results are also used to inform the mapping analysis. Table 5 summarizes the selected upgrades triggered in RESOLVE, showing that there are few upgrades selected through 2035. This is partly due to the construction times associated with the upgrades as provided in the CAISO's 2021 White Paper. Most upgrades have longer completion times and cannot come online or be selected by RESOLVE until the late 2020s period. By 2035 a total of 9,531 MW of partial and full transmission upgrades are selected by the portfolio.

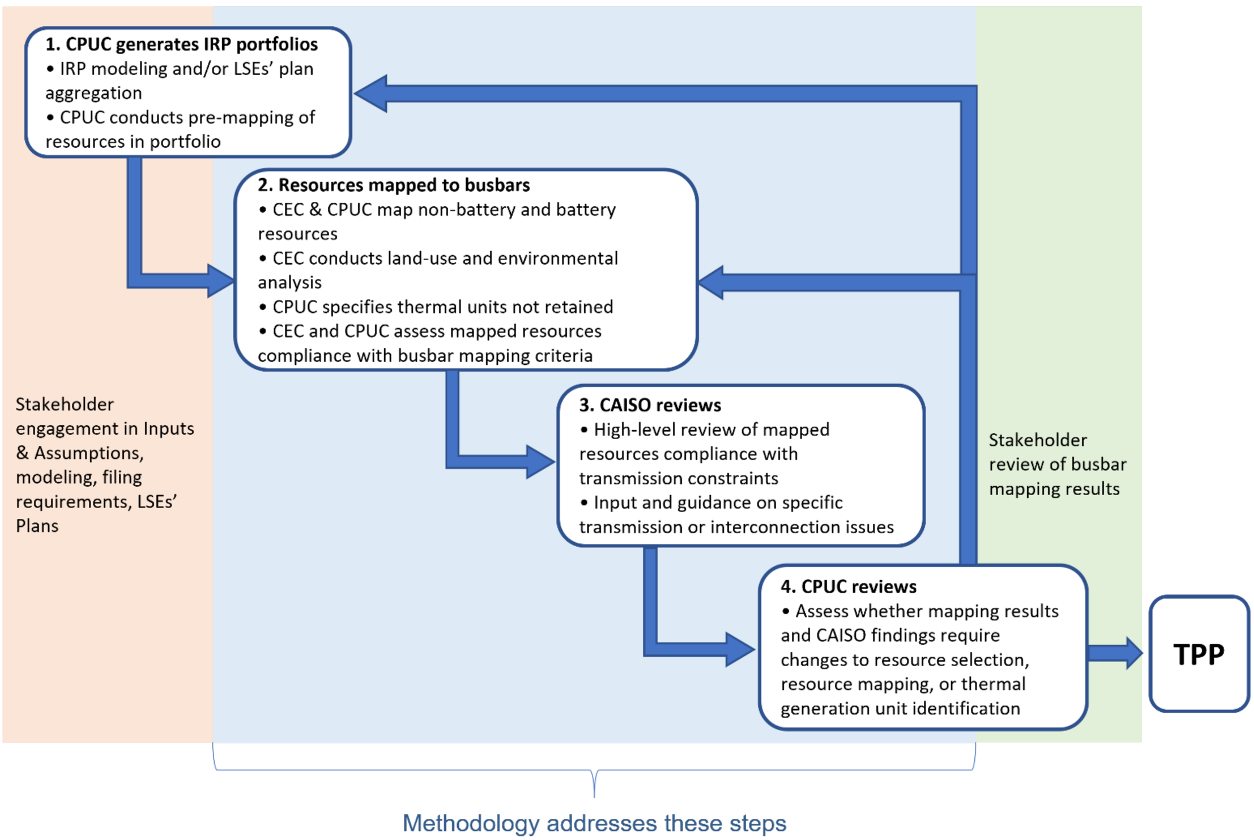
Table 5: Summary of RESOLVE triggered transmission expansion; amounts are in MWs.

Cumulative Transmission Upgrades (MW)									
Transmission Constraint	**2023**	**2024**	**2025**	**2026**	**2028**	**2030**	**2032**	**2033**	**2035**
Colorado_River_500_230_group	-	-	-	-	-	-	-	-	-
Contra_Costa_Delta_Switchyard_230_group	-	-	-	-	-	-	-	-	-
Delevan_Cortina_230_group	-	-	-	-	-	-	-	-	-
Devers_Red_Bluff_group	-	-	-	-	-	-	-	-	-
East_of_Miguel_group	-	-	-	-	-	-	-	-	-
Eldorado_500_230_group	-	-	-	-	-	-	-	-	400
Encina_San_Luis_Rey_group	-	-	-	-	-	-	-	-	456
GLW_VEA_group	-	-	-	-	-	-	-	-	-
Gates_500_230_Transformer_group	-	-	-	-	-	-	-	-	-
Gates_Arco_Midway_230_group	-	-	-	-	-	-	-	-	-
Gates_Panoche_230_group	-	-	-	-	-	-	-	-	-
Greater_LA_group	-	-	-	-	-	-	-	-	-
Humboldt_Offshore_Line_group	-	-	-	-	-	-	161	161	1,607
Humboldt_Trinity_115_group	-	-	-	-	-	-	-	-	-
Imperial_Valley_group	-	-	-	-	-	-	-	-	-
Internal_San_Diego_group	-	-	-	-	-	-	-	-	488
Los_Banos_500_230_Transformer_group	-	-	-	-	-	-	-	-	-
Los_Banos_Gates_500_OPDS_group	-	-	-	-	-	-	-	-	-
Lugo_Transformer_group	-	-	-	-	-	-	980	980	980
Mohave_Eldorado_500_group	-	-	-	-	-	-	-	-	-
Morro_Bay_Offshore_500_group	-	-	-	-	-	2,900	2,900	2,900	2,900
Morro_Bay_Templeton_230_group	-	-	-	-	-	-	-	-	-
Moss_Landing_Los_Banos_230_OPDS_group	-	-	-	-	-	-	-	-	-
San_Luis_Rey_San_Onofre_group	-	-	-	-	-	-	-	-	-
Serrano_Alberhill_group	-	-	-	-	-	-	-	-	-
Silvergate_Bay_Boulevard_group	-	-	-	-	-	-	-	-	-
South_Kramer_Victor_Lugo_group	-	-	-	-	-	-	-	-	-
South_Kramer_Victor_group	-	-	-	-	-	-	-	-	-
Tehachapi_Antelope_group	-	-	-	-	-	-	-	-	2,700
Tesla_Westley_230_group	-	-	-	-	-	-	-	-	-

5. Busbar Mapping Methodology Improvements

Staff from the two agencies and the CAISO completed the steps described in the CPUC Staff Proposal: Methodology for Resource-to-Busbar Mapping & Assumptions for the Annual TPP, except where minor improvements were identified, as summarized here. The full, updated Methodology is available as a separate document (see Appendix A).

Figure 3: Flowchart of the busbar mapping process for the TPP



Improvements to the Staff Proposal were informed by stakeholder feedback, recommendations from the CEC and CAISO, and staff's experience during implementation of the busbar mapping process, as summarized below.

Busbar Mapping Steps

- Clarifying how commercial interest at substations not included as candidate substations in busbar mapping analysis are approximated at the nearest substation already in the candidate substation set.

Busbar Mapping Criteria

- Updating the commercial interest criteria to add further ranking details to the prioritizing of commercial interest based on development status with an additional rank for commercial interest in Phase II of CAISO queue interconnection studies. The mapping criteria prioritization of alignment with commercial interests is thus:

- "High confidence" commercial interest — projects in-development, with allocated transmission plan deliverability (TPD), or that have executed interconnection agreements.
- Projects in Phase II of CAISO's interconnection studies
- Projects in Phase I and other projects in interconnection queues.

6. Analysis

This section outlines the mapping process and notes mapping adjustments made after the initial mapping released with the October 2022 ruling.6 For the non-battery resources staff use a "dashboard" to identify whether busbar allocations of a particular round of mapping of a portfolio comply with the five key criteria described in the Methodology (see Appendix A.). This informs whether changes to the allocation may be required. For the battery resources CPUC staff apply the methodology and analyze it through the lens of achievement of policy objectives, interaction with the non-battery resources, and transmission implications. Both the battery and the non-battery mapping build on the locational information reported in the resource selection results Section 4.2 from the RESOLVE optimization.

Section 6.1 summarizes the results of the initial mapping effort the busbar Working Group staff performed to map all resources to substations for the October 2022 ruling. Full results for both the 2033 and 2035 mapped years at a substation level and the mapped resources compliance with the busbar mapping criteria are detailed in the respective Mapping Dashboards for each portfolio year released with the October ruling. These dashboards are included as Appendix G for 2033 and Appendix H for 2035.

Section 6.2 presents the adjustments made to the mapping post-ruling for the proposed decision. Working Group staff made these adjustments to improve compliance with the busbar mapping criteria, to account for updated information on transmission, commercial interest, and in-development resources, and to incorporate feedback stakeholders provided through ruling comments and replies. These mapping adjustments are summarized by resource area in this section. A full accounting of the adjustments by resource type and substation is in the updated Mapping Dashboards released with this report as Appendix B for 2033 mapping results and Appendix C for 2035 mapping results.

6.1 Initial Mapping Results for October Proposed 23-24 TPP Portfolios Ruling

This section summarizes the results of the initial rounds of mapping that the busbar Working Group comprised of CPUC, CEC, and CAISO staff carried out following the flow chart in Figure 3. To map the resources identified in the 30 MMT with ATE base case portfolio included in the October ruling, staff relied heavily on mapped results of the 22-23 TPP high electrification sensitivity portfolio[9] transmitted to the CAISO on July 1, 2022[10]. The two portfolios are nearly the same and the Working Group only made minor changes to the busbar mapping methodology since conducting the mapping for the 22-23 TPP sensitivity. The proposed 23-24 TPP base case portfolio utilizes the same load scenario as the previous sensitivity and CPUC staff only made minor updates to the RESOLVE model. Thus, the two portfolios are similar with the only significant difference being the proposed 23-24 TPP base case portfolio having ~1,600 MW less solar selected by 2035.

The initial rounds of mapping by the working group resulted in significant shifts to where the resources in the 23-24 TPP base case portfolio were mapped when compared to the mapped results

[9] Dashboard of 2035 mapping results for the 22-23 TPP high electrification sensitivity: https://files.cpuc.ca.gov/energy/modeling/BusbarMapping_30MMT_HESens_Dashboard_08_22_22_TPD_v2.xlsx

[10] July 1, 2022, Joint CPUC and CEC commissioners letter to the CAISO transmitting the 2022-23 TPP High Electrification Portfolio: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2019-2020-irp-events-and-materials/tpp-portfolio-transmittal-letter.pdf

of the 22-23 TPP sensitivity portfolio, particularly for solar and storage resources. These changes were driven by the methodology changes prioritizing mapping to commercial interest that has been allocated transmission planning deliverability (TPD) and the need to align with newly identified in-development resources.

Table 6 below shows a summary by region and resource type of the mapped base case portfolio in 2033 included with the October ruling compared with the 22-23 TPP base case portfolio. Table 7 below compares the October ruling mapping of the base case portfolio in 2035 with the 22-23 TPP sensitivity portfolio. Full mapping results for the base case portfolio included in the October ruling are, again, in Appendix G and Appendix H for modeling years 2033 and 2035 respectively.

Table 6: Summary of October 2022 Ruling mapping results for the 2033 base case portfolio by resource area and type.

RESOLVE Resource Name	Resource Type	RESOLVE Selected (2033)			October Ruling Mapping (2033)			22-23 TPP Base Case (2032)		
		FCDS	EODS	TOTAL	FCDS	EODS	TOTAL	FCDS	EODS	TOTAL
InState Biomass	Biomass/Biogas	134	-	134	134	-	134	134	-	134
Solano_Geothermal	Geothermal	135	-	135	89		89	79	-	79
Northern_California_Geothermal	Geothermal	-	-	-	-		-	-	-	-
Inyokern_North_Kramer_Geothermal	Geothermal	24	-	24	53		53	40	-	40
Southern_Nevada_Geothermal	Geothermal	320	-	320	500		500	440	-	440
Northern_Nevada_Geothermal	Geothermal	-	-	-	221		221	-	-	-
Riverside_Palm_Springs_Geothermal	Geothermal	32	-	32	-		-	-	-	-
Greater_Imperial_Geothermal	Geothermal	640	712	1,352	1,000		1,000	600	-	600
Distributed Solar	Solar	125	-	125	125	-	125	125	-	125
Greater_LA_Solar	Solar	-	3,000	3,000	-	1,603	1,603	-	1,503	1,503
Northern_California_Solar	Solar	-	-	-	625	13	638	-	-	-
Southern_PGAE_Solar	Solar	-	4,751	4,751	3,479	4,009	7,488	1,022	1,781	2,803
Tehachapi_Solar	Solar	-	6,289	6,289	3,660	2,703	6,363	1,751	3,002	4,753
Greater_Kramer_Solar	Solar	-	5,360	5,360	1,371	761	2,132	385	1,071	1,456
Southern_NV_Eldorado_Solar	Solar	-	7,644	7,644	1,432	2,421	3,853	770	1,946	2,716
Riverside_Solar	Solar	-	4,003	4,003	2,025	3,552	5,577	862	1,106	1,968
Arizona_Solar	Solar	-	160	160	900	2,597	3,497	600	1,281	1,881
Imperial_Solar	Solar	-	693	693	120	630	750	100	200	300
Northern_California_Wind	Wind	-	866	866	230	109	339	305	351	656
Solano_Wind	Wind	-	560	560	737	93	830	272	148	420
Humboldt_Wind	Wind	-	34	34	-	-	-	-	-	-
Kern_Greater_Carrizo_Wind	Wind	60	-	60	60	-	60	60	-	60
Carrizo_Wind	Wind	-	287	287	258	-	258	287	-	287
Central_Valley_North_Los_Banos_Wind	Wind	173	-	173	186	-	186	186	-	186
North_Victor_Wind	Wind	-	-	-	-	-	-	-	-	-
Tehachapi_Wind	Wind	-	275	275	284	-	284	275	-	275
Southern_Nevada_Wind	Wind	-	442	442	321	82	403	442	-	442
Riverside_Palm_Springs_Wind	Wind	-	-	-	116	-	116	106	-	106
Baja_California_Wind	Wind	600	-	600	240	360	600	600	-	600
Wyoming_Wind	OOS Wind	2,328	-	2,328	1,500	-	1,500	1,062	-	1,062
Idaho_Wind	OOS Wind	-	-	-	1,000	-	1,000	-	-	-
New_Mexico_Wind	OOS Wind	2,500	-	2,500	2,328	-	2,328	438	-	438
SW_Ext_Tx_Wind	OOS Wind	-	500	500	690	100	790	610	-	610
NW_Ext_Tx_Wind	OOS Wind	-	67	67	-	-	-	-	-	-
Humboldt_Bay_Offshore_Wind	Offshore Wind	161	-	161	41	120	161	-	120	120
Morro_Bay_Offshore_Wind	Offshore Wind	3,100	-	3,100	3,100	-	3,100	1,588	-	1,588
Diablo_Canyon_Offshore_Wind	Offshore Wind	-	-	-	-	-	-	-	-	-
Renewable Resource Total		10,332	35,643	45,976	26,823	19,152	45,975	13,139	12,509	25,647
Greater_LA_Li_Battery	Li_Battery	5,347	-	5,347	2,654	-	2,654	2,861	-	2,861
Northern_California_Li_Battery	Li_Battery	319	-	319	1,226	-	1,226	607	-	607
Southern_PGAE_Li_Battery	Li_Battery	5,690	-	5,690	2,801	-	2,801	1,624	-	1,624
Tehachapi_Li_Battery	Li_Battery	3,530	-	3,530	2,846	-	2,846	3,051	-	3,051
Greater_Kramer_Li_Battery	Li_Battery	2,532	-	2,532	1,260	-	1,260	869	-	869
Southern_NV_Eldorado_Li_Battery	Li_Battery	3,040	-	3,040	3,034	-	3,034	1,236	-	1,236
Riverside_Li_Battery	Li_Battery	617	-	617	4,569	-	4,569	1,608	-	1,608
Arizona_Li_Battery	Li_Battery	0	-	0	1,805	-	1,805	759	-	759
Imperial_Li_Battery	Li_Battery	-	-	-	473	-	473	50	-	50
San_Diego_Li_Battery	Li_Battery	655	-	655	1,064	-	1,064	899	-	899
LI_Battery Total		21,730		21,730	21,730	-	21,730	13,564	-	13,564
SPGE_LDES	LDES	-	-	-	-	-	-	-	-	-
Tehachapi_LDES	LDES	500	-	500	500	-	500	500	-	500
Riverside_East_Pumped_Storage	LDES	500	-	500	524	-	524	-	-	-
Riverside_West_Pumped_Storage	LDES	413	-	413				-	-	-
San_Diego_Pumped_Storage	LDES	111	-	111	500	-	500	500	-	500
LDES Total		1,524		1,524	1,524	-	1,524	1,000	-	1,000
Storage Total		23,254		23,254	23,254	-	23,254	14,564		14,564
Total Storage+Resources		33,586	35,643	69,230	50,078	19,152	69,230	27,702	12,509	40,211

Table 7: Summary of October 2022 Ruling mapping results for the 2035 base case portfolio by resource area and type.

RESOLVE Resource Name	Resource Type	RESOLVE Selected (2035)			October Ruling Mapping (2035)			22-23 TPP Sens. (2035)		
		FCDS	EODS	TOTAL	FCDS	EODS	TOTAL	FCDS	EODS	TOTAL
InState Biomass	Biomass/Biogas	134	-	**134**	134	-	**134**	134	-	**134**
Solano_Geothermal	Geothermal	135	-	**135**	89		**89**	79		**79**
Northern_California_Geothermal	Geothermal	-	-	**-**	-		**-**	-		**-**
Inyokern_North_Kramer_Geothermal	Geothermal	24	-	**24**	53		**53**	48		**48**
Southern_Nevada_Geothermal	Geothermal	320	-	**320**	500		**500**	440		**440**
Northern_Nevada_Geothermal	Geothermal	174	-	**174**	395		**395**	327		**327**
Riverside_Palm_Springs_Geothermal	Geothermal	32	-	**32**	-		**-**	-		**-**
Greater_Imperial_Geothermal	Geothermal	640	712	**1,352**	1,000		**1,000**	900		**900**
Distributed Solar	Solar	125	-	**125**	125	-	**125**	125	-	**125**
Greater_LA_Solar	Solar	-	3,000	**3,000**	125	1,928	**2,053**	125	1,928	**2,053**
Northern_California_Solar	Solar	-	-	**-**	675	795	**1,470**	344	1,512	**1,856**
Southern_PGAE_Solar	Solar	-	11,279	**11,279**	3,744	5,462	**9,206**	3,535	7,439	**10,974**
Tehachapi_Solar	Solar	-	6,289	**6,289**	3,960	3,853	**7,813**	3,031	4,952	**7,983**
Greater_Kramer_Solar	Solar	-	5,360	**5,360**	1,371	1,295	**2,666**	900	2,281	**3,181**
Southern_NV_Eldorado_Solar	Solar	-	8,163	**8,163**	1,312	3,106	**4,418**	1,320	4,196	**5,516**
Riverside_Solar	Solar	-	4,003	**4,003**	2,040	4,222	**6,262**	1,817	3,495	**5,312**
Arizona_Solar	Solar	-	160	**160**	900	3,197	**4,097**	634	2,592	**3,226**
Imperial_Solar	Solar	-	693	**693**	120	843	**963**	100	553	**653**
Northern_California_Wind	Wind	-	866	**866**	230	109	**339**	305	351	**656**
Solano_Wind	Wind	-	560	**560**	737	93	**830**	321	196	**517**
Humboldt_Wind	Wind	-	34	**34**	-	-	**-**	-	-	**-**
Kern_Greater_Carrizo_Wind	Wind	60	-	**60**	60	-	**60**	60	-	**60**
Carrizo_Wind	Wind	-	287	**287**	258	-	**258**	287	-	**287**
Central_Valley_North_Los_Banos_Wind	Wind	173	-	**173**	186	-	**186**	186	-	**186**
North_Victor_Wind	Wind	-	-	**-**	-	-	**-**	100	-	**100**
Tehachapi_Wind	Wind	-	275	**275**	284	-	**284**	281	-	**281**
Southern_Nevada_Wind	Wind	-	442	**442**	321	82	**403**	442	-	**442**
Riverside_Palm_Springs_Wind	Wind	-	-	**-**	116	-	**116**	116	-	**116**
Baja_California_Wind	Wind	600	-	**600**	240	360	**600**	600	-	**600**
Wyoming_Wind	OOS Wind	2,328	-	**2,328**	1,500	-	**1,500**	1,500	-	**1,500**
Idaho_Wind	OOS Wind	-	-	**-**	1,000	-	**1,000**	1,000	-	**1,000**
New_Mexico_Wind	OOS Wind	2,500	-	**2,500**	2,328	-	**2,328**	2,328	-	**2,328**
SW_Ext_Tx_Wind	OOS Wind	-	500	**500**	690	100	**790**	610	-	**610**
NW_Ext_Tx_Wind	OOS Wind	-	67	**67**	-	-	**-**	-	-	**-**
Humboldt_Bay_Offshore_Wind	Offshore Wind	1,607	-	**1,607**	1,487	120	**1,607**	1,487	120	**1,607**
Morro_Bay_Offshore_Wind	Offshore Wind	3,100	-	**3,100**	3,100	-	**3,100**	3,100	-	**3,100**
Diablo_Canyon_Offshore_Wind	Offshore Wind	-	-	**-**	-	-	**-**	-	-	**-**
Renewable Resource Total		**11,952**	**42,690**	**54,642**	**29,078**	**25,564**	**54,642**	**26,581**	**29,614**	**56,196**
Greater_LA_Li_Battery	Li_Battery	6,741	-	**6,741**	4,003	-	**4,003**	4,055	-	**4,055**
Northern_California_Li_Battery	Li_Battery	319	-	**319**	2,608	-	**2,608**	2,198	-	**2,198**
Southern_PGAE_Li_Battery	Li_Battery	7,730	-	**7,730**	4,976	-	**4,976**	6,074	-	**6,074**
Tehachapi_Li_Battery	Li_Battery	6,240	-	**6,240**	4,126	-	**4,126**	3,884	-	**3,884**
Greater_Kramer_Li_Battery	Li_Battery	2,532	-	**2,532**	1,264	-	**1,264**	1,904	-	**1,904**
Southern_NV_Eldorado_Li_Battery	Li_Battery	3,440	-	**3,440**	3,113	-	**3,113**	2,711	-	**2,711**
Riverside_Li_Battery	Li_Battery	617	-	**617**	4,828	-	**4,828**	4,110	-	**4,110**
Arizona_Li_Battery	Li_Battery	0	-	**0**	1,805	-	**1,805**	1,798	-	**1,798**
Imperial_Li_Battery	Li_Battery	-	-	**-**	473	-	**473**	415	-	**415**
San_Diego_Li_Battery	Li_Battery	754	-	**754**	1,179	-	**1,179**	1,254	-	**1,254**
LI_Battery Total		**28,373**		**28,373**	**28,373**	**-**	**28,373**	**28,402**		**28,402**
SPGE_LDES	LDES	-	-	**-**	300	-	**300**	300	-	**300**
Tehachapi_LDES	LDES	500	-	**500**	500	-	**500**	500	-	**500**
Riverside_East_Pumped_Storage	LDES	500	-	**500**	700	-	**700**	700	-	**700**
Riverside_West_Pumped_Storage	LDES	500	-	**500**	-	-	**-**	-	-	**-**
San_Diego_Pumped_Storage	LDES	500	-	**500**	500	-	**500**	500	-	**500**
LDES Total		**2,000**		**2,000**	**2,000**	**-**	**2,000**	**2,000**		**2,000**
Storage Total		**30,373**		**30,373**	**30,373**	**-**	**30,373**	**30,402**		**30,402**
Total Storage+Resources		**42,325**	**42,690**	**85,015**	**59,451**	**25,564**	**85,015**	**56,983**	**29,614**	**86,598**

6.2 Post Ruling Mapping Adjustments

Following the October 7, 2022, ruling, busbar Working Group staff conducted additional rounds of mapping on the base case portfolio resources to improve compliance with the busbar mapping criteria, to incorporate updated datasets and feedback by stakeholders, and to include the methodology changes adopted as noted in Section 5. Key updates and feedback that guided mapping adjustments include:

- Updated online and in-development resources, including feedback from major participating transmission owners (PTOs).
- Updated CAISO interconnection queue (12/02/2022 version) and changed MW amount calculations to cap the MW resource potential of a resource type at the max net MWs to grid listed in the queue. Appendix F shows CPUC staff analysis of CAISO's interconnection queue.
- Methodology update based on stakeholder ruling feedback to consider Cluster 2 projects in the CAISO queue as higher confidence potential projects than non-Cluster 2 projects.
- Guidance on potential transmission upgrades and substation interconnection issues information from the CAISO 22-23 TPP preliminary results stakeholder call on November 17, 2022.[11]
- Stakeholder ruling feedback to better balance mapping criteria of aligning resources with TPD allocation, consistency with similar portfolios from previous TPPs, and prioritization of mapping storage resources to local areas and DACs to better enable gas retirement.
- Additional stakeholder feedback on mapping concerns for specific resources and at specific locations including:
    - Geothermal resources and potential development interest in Northern California and Nevada, and
    - Potential environmental impacts in the North of Lugo area.

The overall shifts in mapped resources in 2033 and 2035 are summarized in Table 8 and Table 9 respectively by resource type and RESOLVE resource area. The previous 22-23 TPP base case portfolio (model year 2032) and the sensitivity portfolio (model year 2035) summaries are again provided for comparison.

Table 10 shows the impact of mapping adjustments for battery storage in 2035 on alignment with the battery-specific mapping criteria. As noted, the mapping adjustments result in over a gigawatt more storage mapped to substations in DACs and nearly two gigawatts more storage mapped in ozone and NO_x air quality non-attainment zones.

[11] CAISO 2022-2023 TPP including the November 17, 2022, 2022-2023 TPP Preliminary Results: https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/2022-2023-Transmission-planning-process

Table 8: Summary of updated mapping results for the 2033 base case portfolio by resource area and type.

RESOLVE Resource Name	Resource Type	Total Resources (2033)			Change from Ruling (2033)			22-23 TPP Base Case (2032)		
		FCDS	EODS	TOTAL	FCDS	EODS	TOTAL	FCDS	EODS	TOTAL
InState Biomass	Biomass/Biogas	134	-	**134**	-	-	-	134	-	**134**
Solano_Geothermal	Geothermal	139		**139**	50	-	**50**	79	-	**79**
Northern_California_Geothermal	Geothermal	-		**-**	-	-	**-**	-	-	**-**
Inyokern_North_Kramer_Geothermal	Geothermal	53		**53**	-	-	**-**	40	-	**40**
Southern_Nevada_Geothermal	Geothermal	500		**500**	-	-	**-**	440	-	**440**
Northern_Nevada_Geothermal	Geothermal	371		**371**	150	-	**150**	-	-	**-**
Riverside_Palm_Springs_Geothermal	Geothermal	-		**-**	-	-	**-**	-	-	**-**
Greater_Imperial_Geothermal	Geothermal	800		**800**	(200)	-	**(200)**	600	-	**600**
Distributed Solar	Solar	125	-	**125**	(0)	-	**(0)**	125	-	**125**
Greater_LA_Solar	Solar	-	1,351	**1,351**	-	(252)	**(252)**	-	1,503	**1,503**
Northern_California_Solar	Solar	505	625	**1,130**	(120)	612	**492**	-	-	**-**
Southern_PGAE_Solar	Solar	3,778	2,336	**6,114**	299	(1,673)	**(1,374)**	1,022	1,781	**2,803**
Tehachapi_Solar	Solar	4,146	2,533	**6,678**	486	(171)	**315**	1,751	3,002	**4,753**
Greater_Kramer_Solar	Solar	1,310	1,000	**2,310**	(61)	239	**178**	385	1,071	**1,456**
Southern_NV_Eldorado_Solar	Solar	1,943	2,031	**3,974**	511	(390)	**121**	770	1,946	**2,716**
Riverside_Solar	Solar	1,958	4,235	**6,193**	(67)	683	**616**	862	1,106	**1,968**
Arizona_Solar	Solar	1,550	1,907	**3,457**	650	(690)	**(40)**	600	1,281	**1,881**
Imperial_Solar	Solar	120	573	**693**	-	(57)	**(57)**	100	200	**300**
Northern_California_Wind	Wind	230	109	**339**	-	-	**-**	305	351	**656**
Solano_Wind	Wind	682	75	**757**	(55)	(18)	**(73)**	272	148	**420**
Humboldt_Wind	Wind	-	-	**-**	-	-	**-**	-	-	**-**
Kern_Greater_Carrizo_Wind	Wind	180	-	**180**	120	-	**120**	60	-	**60**
Carrizo_Wind	Wind	174	-	**174**	(84)	-	**(84)**	287	-	**287**
Central_Valley_North_Los_Banos_Wind	Wind	150	-	**150**	(36)	-	**(36)**	186	-	**186**
North_Victor_Wind	Wind	-	-	**-**	-	-	**-**	-	-	**-**
Tehachapi_Wind	Wind	345	-	**345**	61	-	**61**	275	-	**275**
Southern_Nevada_Wind	Wind	403	-	**403**	82	(82)	**-**	442	-	**442**
Riverside_Palm_Springs_Wind	Wind	107	20	**127**	(9)	20	**12**	106	-	**106**
Baja_California_Wind	Wind	240	360	**600**	-	-	**-**	600	-	**600**
Wyoming_Wind	OOS Wind	1,500	-	**1,500**	-	-	**-**	1,062	-	**1,062**
Idaho_Wind	OOS Wind	1,000	-	**1,000**	-	-	**-**	-	-	**-**
New_Mexico_Wind	OOS Wind	2,328	-	**2,328**	-	-	**-**	438	-	**438**
SW_Ext_Tx_Wind	OOS Wind	690	100	**790**	-	-	**-**	610	-	**610**
NW_Ext_Tx_Wind	OOS Wind	-	-	**-**	-	-	**-**	-	-	**-**
Humboldt_Bay_Offshore_Wind	Offshore Wind	-	161	**161**	(41)	41	**-**	-	120	**120**
Morro_Bay_Offshore_Wind	Offshore Wind	3,100	-	**3,100**	-	-	**-**	1,588	-	**1,588**
Diablo_Canyon_Offshore_Wind	Offshore Wind	-	-	**-**	-	-	**-**	-	-	**-**
Renewable Resource Total		**28,560**	**17,415**	**45,975**	**1,736**	**(1,737)**	**(0)**	**13,139**	**12,509**	**25,647**
Greater_LA_Li_Battery	Li_Battery	3,315	-	**3,315**	661	-	**661**	2,861	-	**2,861**
Northern_California_Li_Battery	Li_Battery	1,778	-	**1,778**	553	-	**553**	607	-	**607**
Southern_PGAE_Li_Battery	Li_Battery	3,116	-	**3,116**	315	-	**315**	1,624	-	**1,624**
Tehachapi_Li_Battery	Li_Battery	2,846	-	**2,846**	-	-	**-**	3,051	-	**3,051**
Greater_Kramer_Li_Battery	Li_Battery	1,165	-	**1,165**	(95)	-	**(95)**	869	-	**869**
Southern_NV_Eldorado_Li_Battery	Li_Battery	1,850	-	**1,850**	(1,184)	-	**(1,184)**	1,236	-	**1,236**
Riverside_Li_Battery	Li_Battery	4,763	-	**4,763**	193	-	**193**	1,608	-	**1,608**
Arizona_Li_Battery	Li_Battery	1,212	-	**1,212**	(593)	-	**(593)**	759	-	**759**
Imperial_Li_Battery	Li_Battery	462	-	**462**	(11)	-	**(11)**	50	-	**50**
San_Diego_Li_Battery	Li_Battery	1,224	-	**1,224**	160	-	**160**	899	-	**899**
LI_Battery Total		**21,730**	**-**	**21,730**	**(1)**	**-**	**(1)**	**13,564**	**-**	**13,564**
SPGE_LDES	LDES	-	-	**-**	-	-	**-**	-	-	**-**
Tehachapi_LDES	LDES	500	-	**500**	-	-	**-**	500	-	**500**
Riverside_East_Pumped_Storage	LDES	524	-	**524**	-	-	**-**	-	-	**-**
Riverside_West_Pumped_Storage	LDES	-	-	**-**	-	-	**-**	-	-	**-**
San_Diego_Pumped_Storage	LDES	500	-	**500**	-	-	**-**	500	-	**500**
LDES Total		**1,524**	**-**	**1,524**	**-**	**-**	**-**	**1,000**	**-**	**1,000**
Storage Total		**23,254**	**-**	**23,254**	**(1)**	**-**	**(1)**	**14,564**		**14,564**
Total Storage+Resources		**51,813**	**17,415**	**69,228**	**1,736**	**(1,737)**	**(1)**	**27,702**	**12,509**	**40,211**

Table 9: Summary of updated mapping results for the 2035 base case portfolio by resource area and type

RESOLVE Resource Name	Resource Type	Total Resources (2035)			Change From Ruling (2035)			22-23 TPP Sens. (2035)		
		FCDS	EODS	TOTAL	FCDS	EODS	TOTAL	FCDS	EODS	TOTAL
InState Biomass	Biomass/Biogas	134	-	134				134	-	134
Solano_Geothermal	Geothermal	139		139	50	-	50	79		79
Northern_California_Geothermal	Geothermal	-		-	-	-	-	-		-
Inyokern_North_Kramer_Geothermal	Geothermal	53		53	-	-	-	48		48
Southern_Nevada_Geothermal	Geothermal	500		500	-	-	-	440		440
Northern_Nevada_Geothermal	Geothermal	445		445	50	-	50	327		327
Riverside_Palm_Springs_Geothermal	Geothermal	-		-	-	-	-	-		-
Greater_Imperial_Geothermal	Geothermal	900		900	(100)	-	(100)	900		900
Distributed Solar	Solar	125	-	125	(0)	-	(0)	125	-	125
Greater_LA_Solar	Solar	125	1,776	1,901	-	(152)	(152)	125	1,928	2,053
Northern_California_Solar	Solar	685	1,061	1,746	10	266	276	344	1,512	1,856
Southern_PGAE_Solar	Solar	4,123	4,738	8,861	379	(724)	(345)	3,535	7,439	10,974
Tehachapi_Solar	Solar	4,146	2,738	6,883	186	(1,116)	(930)	3,031	4,952	7,983
Greater_Kramer_Solar	Solar	1,310	1,350	2,660	(61)	55	(6)	900	2,281	3,181
Southern_NV_Eldorado_Solar	Solar	2,157	2,786	4,943	845	(320)	525	1,320	4,196	5,516
Riverside_Solar	Solar	1,958	4,535	6,493	(82)	313	231	1,817	3,495	5,312
Arizona_Solar	Solar	1,550	2,947	4,497	650	(250)	400	634	2,592	3,226
Imperial_Solar	Solar	120	843	963	-	-	-	100	553	653
Northern_California_Wind	Wind	230	109	339	-	-	-	305	351	656
Solano_Wind	Wind	682	75	757	(55)	(18)	(73)	321	196	517
Humboldt_Wind	Wind	-	-	-	-	-	-	-	-	-
Kern_Greater_Carrizo_Wind	Wind	180	-	180	120	-	120	60	-	60
Carrizo_Wind	Wind	174	-	174	(84)	-	(84)	287	-	287
Central_Valley_North_Los_Banos_Wind	Wind	150	-	150	(36)	-	(36)	186	-	186
North_Victor_Wind	Wind	-	-	-	-	-	-	100	-	100
Tehachapi_Wind	Wind	345	-	345	61	-	61	281	-	281
Southern_Nevada_Wind	Wind	403	-	403	82	(82)	-	442	-	442
Riverside_Palm_Springs_Wind	Wind	107	20	127	(9)	20	12	116	-	116
Baja_California_Wind	Wind	240	360	600	-	-	-	600	-	600
Wyoming_Wind	OOS Wind	1,500	-	1,500	-	-	-	1,500	-	1,500
Idaho_Wind	OOS Wind	1,000	-	1,000	-	-	-	1,000	-	1,000
New_Mexico_Wind	OOS Wind	2,328	-	2,328	-	-	-	2,328	-	2,328
SW_Ext_Tx_Wind	OOS Wind	690	100	790	(0)	-	(0)	610	-	610
NW_Ext_Tx_Wind	OOS Wind	-	-	-	-	-	-	-	-	-
Humboldt_Bay_Offshore_Wind	Offshore Wind	1,446	161	1,607	(41)	41	-	1,487	120	1,607
Morro_Bay_Offshore_Wind	Offshore Wind	3,100	-	3,100	-	-	-	3,100	-	3,100
Diablo_Canyon_Offshore_Wind	Offshore Wind	-	-	-	-	-	-	-	-	-
Renewable Resource Total		**31,043**	**23,598**	**54,642**	**1,965**	**(1,965)**	**(0)**	**26,581**	**29,614**	**56,196**
Greater_LA_Li_Battery	Li_Battery	4,580	-	4,580	578	-	578	4,055	-	4,055
Northern_California_Li_Battery	Li_Battery	2,477	-	2,477	(131)	-	(131)	2,198	-	2,198
Southern_PGAE_Li_Battery	Li_Battery	5,204	-	5,204	228	-	228	6,074	-	6,074
Tehachapi_Li_Battery	Li_Battery	3,668	-	3,668	(458)	-	(458)	3,884	-	3,884
Greater_Kramer_Li_Battery	Li_Battery	1,404	-	1,404	140	-	140	1,904	-	1,904
Southern_NV_Eldorado_Li_Battery	Li_Battery	2,689	-	2,689	(424)	-	(424)	2,711	-	2,711
Riverside_Li_Battery	Li_Battery	4,863	-	4,863	35	-	35	4,110	-	4,110
Arizona_Li_Battery	Li_Battery	1,662	-	1,662	(143)	-	(143)	1,798	-	1,798
Imperial_Li_Battery	Li_Battery	503	-	503	30	-	30	415	-	415
San_Diego_Li_Battery	Li_Battery	1,324	-	1,324	145	-	145	1,254	-	1,254
LI_Battery Total		**28,373**	**-**	**28,373**	**(0)**	**-**	**(0)**	**28,402**		**28,402**
SPGE_LDES	LDES	300	-	300	-	-	-	300	-	300
Tehachapi_LDES	LDES	500	-	500	-	-	-	500	-	500
Riverside_East_Pumped_Storage	LDES	700	-	700	-	-	-	700	-	700
Riverside_West_Pumped_Storage	LDES	-	-	-	-	-	-	-	-	-
San_Diego_Pumped_Storage	LDES	500	-	500	-	-	-	500	-	500
LDES Total		**2,000**	**-**	**2,000**	**-**	**-**	**-**	**2,000**		**2,000**
Storage Total		**30,373**	**-**	**30,373**	**(0)**	**-**	**(0)**	**30,402**		**30,402**
Total Storage+Resources		**61,416**	**23,598**	**85,015**	**1,965**	**(1,965)**	**(0)**	**56,983**	**29,614**	**86,598**

Table 10: Updated battery mapping alignment with the four main storage centric mapping criteria.

Battery Adjustments Criteria Summary (2035)			
Battery Category	**Ruling Capacity (MW)**	**Adjustments**	**Updated Capacity (MW)**
Co-Located in LCR Areas	2,560	313	2,873
Stand-Alone in LCR Areas	3,719	362	4,081
Total in LCR Areas	**6,279**	**675**	**6,954**
Co-Located in DACs	3,146	563	3,709
Stand-Alone in DACs	1,984	816	2,800
Total in DACs	**5,130**	**1,378**	**6,509**
Co-Located in Non-Attainment Zones	12,735	90	12,826
Stand-Alone in Non-Attainment Zones	4,714	1,842	6,556
Total in Non-Attainment Zones	**17,449**	**1,932**	**19,381**
Co-Located in High-Curtailment Zones	12,962	(347)	12,614
Stand-Alone in High-Curtailment Zones	475	468	943
Total in High-Curtailment Zones	**13,437**	**120**	**13,557**

In the following sections, the summary of mapping adjustments made by busbar Working Group staff are broken down by areas: Northern California, Southern PG&E, Greater Tehachapi (which includes the Northern SCE transmission up to Big Creek Hydro facilities), Greater LA Metro (which includes most of Orange County and the Simi and Santa Clara Valleys), Greater Kramer (which includes up to the Control substation and over to the Pisgah and Calcite substations), Southern Nevada (which includes GLW and the El Dorado and Mohave substations), Riverside, Arizona, San Diego, and Imperial. Full substation level mapping adjustments are in the Mapping Dashboards for the Proposed Decision included as Appendix B for 2033 and Appendix C for 2035.

6.2.A Northern California

The Northern California area includes the Greater Bay Area, the Tesla substation area, and all the state to the north and east of those areas. Table 11 shows the initial ruling mapping totals for Northern California and the net mapping adjustments made post-ruling.

Table 11: October 2022 Ruling mapping summary and post-ruling mapping adjustments for the Northern California area by resource type and status

October Ruling Resources in Northern California														
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	3	-	8	-	73	-	-	-	84	-	**84**
Geothermal	-	-	-	-	89	-	-	-	89	-	**89**
Geothermal OOS	-	-	40	-	-	-	-	-	40	-	**40**
Distributed Solar	-	-	8	-	37	-	-	-	45	-	**45**
Utility-Scale Solar	-	3	120	-	505	10	50	782	675	795	**1,470**
Wind	56	-	-	-	911	201	-	-	967	201	**1,168**
Offshore Wind	-	-	-	-	-	161	1,446	-	1,446	161	**1,607**
Li_Battery	208	-	782	-	236	-	1,383	-	2,608	-	**2,608**

Resource Mapping Adjustments											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	1	-	(4)	-	22	-	-	-	19	-	**19**
Geothermal	-	-	-	-	50	-	-	-	50	-	**50**
Geothermal OOS	-	-	-	-	-	-	-	-	-	-	**-**
Distributed Solar	10	-	12	-	(28)	-	-	-	(5)	-	**(5)**
Utility-Scale Solar	-	-	(120)	132	-	480	130	(346)	10	266	**276**
Wind	(1)	-	-	-	(54)	(18)	-	-	(55)	(18)	**(73)**
Offshore Wind	-	-	-	-	-	-	-	-	-	-	**-**
Li_Battery	-	-	197	-	356	-	(684)	-	(131)	-	**(131)**

Key mapping adjustments for the area are:

- Added geothermal resources to the Solano (Geysers) geothermal area from the Imperial area to address the full commercial interest in the area and stakeholder feedback on development potential.
- Relocated wind mapped to the Cortina substation because updated commercial interest information showed that the development interest had withdrawn from the CAISO queue. Shifted those wind resources to other substations in Northern CA, Southern PG&E, and Riverside with commercial interest.
- Relocated generic batteries resources from multiple substations to substations with newly identified in-development resources in Northern CA and in other regions.

6.2.B Southern PG&E

The Southern PG&E area includes most of the San Joaquin valley and the Central Coast area, including Moss Landing, serviced by the PG&E transmission system. Table 12Table 11 shows the initial ruling mapping totals for Southern PG&E and the net mapping adjustments made post-ruling.

Table 12: October 2022 Ruling mapping summary and post-ruling mapping adjustments for the Southern PG&E area by resource type and status.

October Ruling Resources in Southern PG&E

Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	4	-	4	-	-	-	8	-	**8**
Geothermal	-	-	-	-	-	-	-	-	-	-	**-**
Distributed Solar	-	-	29	-	18	-	-	-	47	-	**47**
Utility-Scale Solar	740	-	862	108	1,878	3,901	265	1,453	3,744	5,462	**9,206**
Wind	-	-	167	-	337	-	-	-	504	-	**504**
Offshore Wind	-	-	-	-	3,100	-	-	-	3,100	-	**3,100**
Li_Battery	747	-	749	-	1,304	-	2,175	-	4,976	-	**4,976**
LDES	-	-	-	-	-	-	300	-	300	-	**300**

Resource Mapping Adjustments

Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	1	-	3	-	-	-	4	-	**4**
Geothermal	-	-	-	-	-	-	-	-	-	-	**-**
Distributed Solar	-	-	2	-	3	-	-	-	5	-	**5**
Utility-Scale Solar	(179)	87	330	282	148	(2,042)	80	949	379	(724)	**(345)**
Wind	-	-	9	-	(8)	-	-	-	0	-	**0**
Offshore Wind	-	-	-	-	-	-	-	-	-	-	**-**
Li_Battery	183	-	868	-	(735)	-	(87)	-	228	-	**228**
LDES	-	-	-	-	-	-	-	-	-	-	**-**

Key mapping adjustments for the Southern PG&E area are:

- Shifted wind mapped to the Cholame 70 kV bus and portions of wind mapped to Los Banos and Templeton to the Caliente substation to better align with commercial interest and avoid potential transmission issues that could be caused by Cholame's low voltage.
- Reduced solar resources mapped to Mustang, Tranquility, and Helm to better align with updated commercial interest.
- Shifted solar resources amongst Midway's 500 kV, 230 kV, 115 kV buses to better align with commercial interest.
- Reduced battery resources mapped to Midway 230 kV, Tranquility 230 kV, Moss Landing 500 kV, and Caliente 230 kV to better align with high confidence commercial interest and in-development resources at Moss Landing 230 kV and Gates 230 kV and to align with previously mapped storage at Mesa 115 kV and Lamont 115 kV that the 21-22 TPP identified as alternatives to transmission solutions.
- Mapped solar and storage to Gregg and Solar SS substations and solar to Borden and Lamont substations to better align with mapped resources in the 22-23 TPP sensitivity portfolio.

6.2.C Greater Tehachapi

The Greater Tehachapi area comprises the Tehachapi renewable area centered around Antelope, Whirlwind, and Windhub substations plus the SCE Northern Area transmission system up to the Big Creek hydroelectric facilities. Table 13 shows the initial ruling mapping totals for Greater Tehachapi and the net mapping adjustments made post-ruling.

Table 13: October 2022 Ruling mapping summary and post-ruling mapping adjustments for the Greater Tehachapi area by resource type and status.

October Ruling Resources in Greater Tehachapi												
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	-	-	9	-	-	-	9	-	**9**
Distributed Solar	-	-	6	-	-	-	-	-	6	-	**6**
Utility-Scale Solar	746	-	1,031	600	1,883	2,103	300	1,150	3,960	3,853	**7,813**
Wind	169	-	3	-	112	-	-	-	284	-	**284**
Li_Battery	400	-	1,939	-	507	-	1,280	-	4,126	-	**4,126**
LDES	-	-	-	-	500	-	-	-	500	-	**500**
Resource Mapping Adjustments											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	-	-	-	-	-	-	-	-	**-**
Distributed Solar	-	-	-	-	-	-	-	-	-	-	**-**
Utility-Scale Solar	(28)	10	14	-	500	(181)	(300)	(945)	186	(1,116)	**(930)**
Wind	49	-	-	-	12	-	-	-	61	-	**61**
Li_Battery	172	-	(238)	-	66	-	(458)	-	(458)	-	**(458)**
LDES	-	-	-	-	-	-	-	-	-	-	**-**

Key mapping adjustments for the Tehachapi area are:

- Reduced the amount of battery storage mapped at Windhub 230 kV and 500 kV buses and slightly reduced batteries mapped to Whirlwind 230 kV and Vestal 230 kV despite large commercial interest. Batteries were mapped to other substations that had higher battery criteria alignment and to better align with newly identified in-development battery resources.
- Reduced, significantly, the amount of solar mapped to Whirlwind 230 kV and Windhub 500 kV substations and mapped the resources to other areas to improve prior mapping alignment and limit potential overcrowding of interconnections in the Tehachapi area. Both buses have large amounts of solar still mapped to them and with the area already well developed, CPUC staff agreed with stakeholders concerns that new resources may have difficulty siting and interconnecting without potential additional costs.
- Increased solar resources mapped to Springville and Rector substations to better align with previous mapping in the 22-23 TPP sensitivity and with commercial interest in the San Joaquin valley.

6.2.D Greater LA Metro

The Greater LA Metro area also include Orange County to the south and the Simi and Santa Clara Valleys out to the Goleta substation in Ventura and Santa Barbara Counties to the north. Table 14 shows the initial ruling mapping totals for Greater LA Metro and the net mapping adjustments made post-ruling. The key mapping adjustment for the LA Metro area is:

- Shifted 200 MW of battery storage from the Vincent substation and nearly 600 MW of battery storage from other areas to substations in the Metro area to align with newly identified in-development and soon to be in-construction resources at substations within DACs or near existing thermal plants.

Table 14: Greater LA Metro area's October 2022 Ruling mapping summary and post-ruling adjustments by resource type and status.

October Ruling Resources in Greater LA Metro												
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	5	-	1	-	-	-	6	-	**6**
Distributed Solar	-	-	-	-	20	-	-	-	20	-	**20**
Utility-Scale Solar	-	-	-	1	-	1,602	125	325	125	1,928	**2,053**
Li_Battery	246	-	646	-	1,762	-	1,349	-	4,003	-	**4,003**
Resource Mapping Adjustments											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	2	-	(2)	-	-	-	-	-	-	-	**-**
Distributed Solar	-	-	20	-	(20)	-	-	-	-	-	**-**
Utility-Scale Solar	-	-	-	-	-	(252)	-	100	-	(152)	**(152)**
Li_Battery	20	-	1,135	-	(493)	-	(84)	-	578	-	**578**

6.2.E Greater Kramer

The Greater Kramer area includes, in addition to the region around the Victor and Kramer substations, the areas east out to the Pisgah substation, south to the Lucerne valley, and north up to SCE's Control substation. Table 15 shows the initial ruling mapping totals for the Greater Kramer area and the net mapping adjustments made post-ruling. The area only had a small series of adjustments with the key few being:

- Reduced solar resources mapped to Kramer substation given the potential higher environmental impacts in the area, although there is a significant amount already in development.
- Solar from Kramer was mapped to Pisgah along with battery storage from Southern Nevada to improve consistency with mapping in the 22-23 TPP sensitivity.
- Small adjustments to resources mapped at other substations in the area to align with updated in-development and commercial interest information.

Table 15: October 2022 Ruling mapping summary and post-ruling adjustments for the Greater Kramer area by resource type and status.

October Ruling Resources in Greater Kramer											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	22	-	3	-	-	-	25	-	**25**
Geothermal	40	-	-	-	-	-	-	-	40	-	**40**
Geothermal OOS	-	-	13	-	-	-	-	-	13	-	**13**
Distributed Solar	-	-	5	-	2	-	-	-	7	-	**7**
Utility-Scale Solar	100	-	620	510	651	251	0	534	1,371	1,295	**2,666**
Li_Battery	50	-	700	-	510	-	4	-	1,264	-	**1,264**

Resource Mapping Adjustments											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	(20)	-	(3)	-	-	-	(22)	-	**(22)**
Geothermal	-	-	-	-	-	-	-	-	-	-	**-**
Geothermal OOS	-	-	-	-	-	-	-	-	-	-	**-**
Distributed Solar	-	-	-	-	-	-	-	-	-	-	**-**
Utility-Scale Solar	-	-	5	40	(66)	199	(0)	(184)	(61)	55	**(6)**
Li_Battery	-	-	-	-	(95)	-	235	-	140	-	**140**

6.2.F Southern Nevada

Southern Nevada includes the GLW area, resources at the El Dorado, Ivanpah, and Mohave substations, and imports of out of BAA areas interconnecting at CAISO interties in the Nevada area. Table 16 shows the initial ruling mapping totals for the Southern Nevada and El Dorado area and the net mapping adjustments made post-ruling.

Table 16: Southern Nevada and Eldorado area's October 2022 Ruling mapping summary and post-ruling adjustments by resource type and status.

October Ruling Resources in Southern Nevada											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Geothermal	-	-	-	-	500	-	-	-	500	-	**500**
Geothermal OOS*	-	-	76	-	105	-	174	-	355	-	**355**
Utility-Scale Solar	-	-	260	249	1,172	2,172	-	565	1,432	2,986	**4,418**
Wind	-	-	-	-	321	82	-	-	321	82	**403**
OOS Wind, New Tx	-	-	-	-	2,500	-	-	-	2,500	-	**2,500**
OOS Wind, Ext Tx	571	100	-	-	-	-	-	-	571	100	**671**
Li_Battery	-	-	440	-	2,594	-	79	-	3,113	-	**3,113**

Resource Mapping Adjustments											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Geothermal	-	-	-	-	-	-	-	-	-	-	**-**
Geothermal OOS*	-	-	-	-	150	-	(100)	-	50	-	**50**
Utility-Scale Solar	-	-	-	(9)	511	(381)	214	190	725	(200)	**525**
Wind	-	-	-	-	82	(82)	-	-	82	(82)	**-**
OOS Wind, New Tx	-	-	-	-	-	-	-	-	-	-	**-**
OOS Wind, Ext Tx	-	-	-	-	-	-	-	-	-	-	**-**
Li_Battery	-	-	(12)	-	(1,172)	-	760	-	(424)	-	**(424)**

*OOS in this case denotes out-of-state and outside of CAISO BAA

Key mapping adjustments for the Southern Nevada, Eldorado and Mohave areas are:

- Relocated the 200 MW of storage mapped to Ivanpah 230 kV and 800 MW of storage mapped to Mohave 500 kV. Shifted 600 MW of the battery storage to other Southern Nevada substations and 400 MW to the Kramer and LA Metro areas.
- Shifted 300 MW of solar from Mohave 500 kV and added an additional 900 MW of solar from other areas to southern Nevada substations.
- Shifted 50 MW of geothermal from Imperial area to Northern Nevada geothermal.

The large solar and storage mapping adjustments are centered around Working Group staff's efforts to strike a balance between alignment with TPD allocations, consistency with similar portfolios in previous TPPs, and environmental impact potentials. Prior portfolio mappings had more resources mapped to GLW substations, while the Mohave substation has significantly more TPD allocated but less resources previously mapped to it in past portfolios. Additionally, staff have noted in previous TPP reports that large amounts of solar mapped to Mohave could have higher potential environmental impacts. The relocation of storage resources to the Kramer and LA metro areas were to align with previous mappings in the Kramer area and to account for the newly identified in-development resources in the LA Metro area at substations with high alignment with the battery-specific mapping criteria.

6.2.G Riverside & Arizona

The Riverside and Arizona areas includes Arizona substations within CAISO's BAA and out-of-BAA resources being imported at the Palo Verde intertie. Table 17 shows the initial ruling mapping totals for the Riverside and Arizona areas combined and the net mapping adjustments made post-ruling.

Table 17: October 2022 Ruling mapping summary and post-ruling adjustments for Riverside and Arizona areas by resource type and status.

October Ruling Resources in Riverside & Arizona												
Resource Type	**Online Resources (by 8/1/2022)**		**In-Development Resources**		**2033 Generic Resources**		**2035 Additional Resources**		**Total Resources (2035)**		
	FCDS	**EODS**	**FCDS**	**EODS**	**FCDS**	**EODS**	**FCDS**	**EODS**	**FCDS**	**EODS**	**TOTAL**
Biomass/gas	-	-	3	-	-	-	-	-	3	-	**3**
Utility-Scale Solar	1,092	237	1,262	1,359	571	4,553	15	1,270	2,940	7,419	**10,359**
Wind	106	-	9	-	1	-	-	-	116	-	**116**
OOS Wind, Ext Tx	119	-	-	-	-	-	-	-	119	-	**119**
OOS Wind, New Tx	-	-	-	-	2,328	-	-	-	2,328	-	**2,328**
Li_Battery	658	-	2,382	-	3,335	-	258	-	6,633	-	**6,633**
LDES	-	-	-	-	524	-	176	-	700	-	**700**

Resource Mapping Adjustments											
Resource Type	**Online Resources (by 8/1/2022)**		**In-Development Resources**		**2033 Generic Resources**		**2035 Additional Resources**		**Total Resources (2035)**		
	FCDS	**EODS**	**FCDS**	**EODS**	**FCDS**	**EODS**	**FCDS**	**EODS**	**FCDS**	**EODS**	**TOTAL**
Biomass/gas	-	-	-	-	-	-	-	-	-	-	**-**
Utility-Scale Solar	(305)	559	(539)	104	1,427	(670)	(15)	70	568	63	**631**
Wind	0	-	(9)	-	-	20	-	-	(9)	20	**12**
OOS Wind, Ext Tx	-	-	-	-	-	-	-	-	-	-	**-**
OOS Wind, New Tx	-	-	-	-	-	-	-	-	-	-	**-**
Li_Battery	534	-	1,094	-	(2,027)	-	292	-	(108)	-	**(108)**
LDES	-	-	-	-	-	-	-	-	-	-	**-**

Key mapping adjustments for the Riverside and Arizona areas are:

- Large shifts of storage and solar resource between generic, in-development, and online to account for updated and newly identified online and in-development resources.
- Large shifts of storage and solar from Colorado River 500 kV to Colorado River 230 kV to account for updates to in-development resources and commercial interest.
- Reduced solar resources mapped to Redbluff 230 and 500 kV substations to better align with updated commercial interest and reduce potential environmental implications.
- Increased solar resources mapped to Delaney and Devers substations to align with CI and consistency with 22-23 TPP sensitivity portfolio, respectively.

6.2.H San Diego & Imperial

Table 18 shows the initial ruling mapping totals for the San Diego and Imperial areas combined, which includes resources mapped to the Imperial Irrigation District's service area, and the net mapping adjustments made post-ruling. In the mapping adjustments, small additions of storage were made at several San Diego area substations to align with newly identified in-development resources. Additionally, staff relocated 100 MW of geothermal from Imperial to Northern California's Geysers area and Northern Nevada geothermal to better align with commercial interest in the various interconnection queues.

Table 18: October 2022 Ruling mapping summary and post-ruling adjustments for San Diego and Imperial areas by resource type and status.

October Ruling Resources in San Diego & Imperial

Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Geothermal, IID	-	-	76	-	924	-	-	-	1,000	-	**1,000**
Utility-Scale Solar	-	-	20	190	100	440	-	213	120	843	**963**
Wind	105	-	-	-	135	360	-	-	240	360	**600**
Li_Battery	339	-	981	-	217	-	115	-	1,652	-	**1,652**
LDES	-	-	-	-	500	-	-	-	500	-	**500**

Resource Mapping Adjustments

Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Geothermal, IID	-	-	-	-	(200)	-	100	-	(100)	-	**(100)**
Utility-Scale Solar	20	-	(20)	220	-	(277)	-	57	-	-	**-**
Wind	-	-	-	-	-	-	-	-	-	-	**-**
Li_Battery	60	-	220	-	(131)	-	26	-	175	-	**175**
LDES	-	-	-	-	-	-	-	-	-	-	**-**

7. Results

Sections 7.1 - 7.8 summarize by region the mapping results included with the January 2023 Proposed Decision[12] following the mapping adjustments outlined previously and highlight the mapped resources compliance with the criteria outlined in the Methodology (Appendix A). Each section below summarizes the resources mapped to the region, the 2035 mapped resources compliance with the busbar mapping criteria, and key transmission implications of the mapping. The Mapping Dashboards for the Proposed Decision (Appendix B for 2033 and Appendix C for 2035) contain the full details of these updated mappings and the full busbar mapping criteria analysis.

7.1 Northern California Mapping Results

Mapped Resources Summary

Table 19 summarizes the final mapped resources in the Northern California area after post-ruling mapping adjustments.

Table 19: Summary of mapped resources in the Northern California area.

Updated Resources in Northern California												
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	4	-	4	-	95	-	-	-	102	-	**102**
Geothermal	-	-	-	-	139	-	-	-	139	-	**139**
Geothermal OOS	-	-	40	-	-	-	-	-	40	-	**40**
Distributed Solar	10	-	20	-	10	-	-	-	40	-	**40**
Utility-Scale Solar	-	3	-	132	505	490	180	436	685	1,061	**1,746**
Wind	55	-	-	-	857	184	-	-	912	184	**1,095**
Offshore Wind	-	-	-	-	-	161	1,446	-	1,446	161	**1,607**
Li_Battery	208	-	978	-	592	-	699	-	2,477	-	**2,477**

Busbar Mapping Criteria Compliance

Table 20 and Table 21 depict the final busbar mapping criteria alignment for non-storage and storage resources in 2035, respectively, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the 2033 mapped resources are in the 2033 Dashboard.

[12] January 13, 2023, Proposed Decision Ordering Supplemental Mid-Term Reliability Procurement (2026-2027) and Transmitting Electric Resource Portfolios to CAISO for the 2023-2024 TPP: https://docs.cpuc.ca.gov/SearchRes.aspx?docformat=ALL&docid=501102663

Table 20: Summary of the 2035 mapped renewable resources in the Northern California area by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources						Busbar Mapping Criteria Compliance						
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	Co-located w/ mapped storage
Bellota	230	Solar	100	-	100	1	1*	1	1	2	1	
Bellota	115	Solar	-	250	250	1	1	1	1	2	1	Yes
Birds Landing	230	In-State Wind	90	45	135	2	1*	1	1	1+	1	
Cayetano	230	Solar	-	100	100	1	1	1	2	1	1	Yes
Cortina	115	Solar	-	230	230	1	2	1	1	1	1	Yes
Cottonwood	230	Solar	75	-	75	1	1*	1	1	2	1	
Delevan	230	Solar	75	385	460	1	1*	1	1	1+	1	Partial
Delevan	230	In-State Wind	-	-	-	1	1*	1	1	1	3	
Delta Switching Yard	230	In-State Wind	80	-	80	1	1*	1	1	1	1	
Fulton	230	Geothermal	56	-	56	2	1*	1	2	2	1	
Geysers	230	Geothermal	83	-	83	1	1*	1	2	2	1	
Glenn	230	In-State Wind	30	98	128	1	1*	1	1	3	2	
Humboldt	115	Offshore Wind	-	161	161	N/A	2	N/A	N/A	1	1	
Humboldt (Proposed)	500	Offshore Wind	1,446	-	1,446	N/A	1*	N/A	N/A	2	1	
Kelso	230	In-State Wind	47	5	52	1	1*	1	1	1	1	
Rio Oso	230	Solar	30	11	41	1	1*	1	1	2	1	
Round Mountain	230	In-State Wind	200	11	211	1	1*	2	3	1	2	
Summit	115	Geothermal	40	-	40	N/A	2	N/A	N/A	1	1	
Tesla	500	Solar	400	10	410	1*	1*	1	1	1	1	
Tesla	230	In-State Wind	80	5	85	1	1*	1	1	1	3	
Tesla	500	In-State Wind	330	20	350	1*	1*	1	1	2+	1	
Thermalito	230	In-State Wind	-	-	-	1	1*	1	1	1	3	
Vaca Dixon	115	Solar	5	20	25	1	1*	1	1	1	1	Yes
Woodland	115	Solar	-	52	52	1	1	1	1	1	1	Yes

Table 21: Summary of the 2035 mapped storage resources in the Northern California area by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources				Busbar Mapping Criteria Compliance			Additional Battery Mapping Criteria				
Substation	Voltage	Resource Type	Total (MW)	2. Tx Capability Limit	4. Commercial Interest	5. Prior Base Case	Co-located w/ mapped solar	LCR	DAC	O3 or PM2.5 non-attainment zone	High curtailment zone
Bellota	115	Li_Battery	160	1*	1	1	Yes	0	0	1	0
Birds Landing	230	Li_Battery	-	1*	1+	1		1	0	1	0
Cayetano	230	Li_Battery	100	1*	1	1	Yes	1	0	1	0
Cortina	115	Li_Battery	150	3	2+	1	Yes	0	0	0	0
Curtis	115	Li_Battery	10	1*	1	1		0	0	1	0
Delevan	230	Li_Battery	80	1*	1+	1	Yes	0	0	0	0
Fulton	230	Li_Battery	25	1*	1+	1		1	0	1	0
Geysers	230	Li_Battery	-	1*	2+	1		0	0	0	0
Gold Hill	115	Li_Battery	50	1*	1	1		1	0	1	0
Humboldt	115	Li_Battery	5	3	3	3		0	0	0	0
Lakeville	230	Li_Battery	33	1*	1	1		0	0	1	0
Los Esteros	115	Li_Battery	200	1*	1+	1		1	1	1	0
Martin (San Francisco	115	Li_Battery	255	1*	1	1		1	0	1	0
Martinez	115	Li_Battery	20	1*	1	1		0	1	1	0
Mendocino	115	Li_Battery	-	3	1	3		No Data	No Data	No Data	No Data
Metcalf	230	Li_Battery	315	1*	2+	1		0	0	1	0
Richmond	115	Li_Battery	55	1*	1	1		No Data	No Data	No Data	No Data
Ripon	115	Li_Battery	100	1*	1	1		1	0	1	0
Round Mountain	230	Li_Battery	-	1*	1+	1		0	0	0	0
Tesla	230	Li_Battery	400	1*	2+	1		0	0	1	0
Tesla	500	Li_Battery	-	1*	1+	1		0	0	1	0
Vaca Dixon	115	Li_Battery	275	1*	2+	1	Partial	0	0	1	0
Woodland	115	Li_Battery	36	1*	1	1	Yes	1	0	1	0

Transmission Implications

The mapped resources shown above result in transmission exceedances in three Northern California area CAISO's 2021 White Paper transmission constraints: Contra Costa-Delta Switchyard 230kV Line, Cortina -Vaca-Dixon 230kV Line, and Humboldt-Trinity 115 kV Line. These are exceeded in both the 2033 and 2035 mappings. Additionally, for the 2035 mapping results, the offshore wind mapped to Humboldt would require new transmission development.

The Cortina -Vaca-Dixon 230kV Line and Contra Costa-Delta Switchyard 230kV Line constraint exceedances could be alleviated with the identified upgrades costing an estimated $3,530 million and $505 million and providing an estimated 2,840 MW and 1,480 MW of additional capacity respectively. CPUC staff views these two upgrades as potentially cost-effective given the amount and diversity of resources mapped to the Northern California area in the 2035 mapping results. However, the previously approved 21-22 TPP upgrades and several small upgrades may sufficiently accommodate these mapped resources without needing these major upgrades identified in the CAISO's 2021 White Paper. The preliminary 22-23 TPP results indicate that the sensitivity portfolio, which has a comparable number of resources in similar locations to the 2033 mapping results, only likely needs several smaller upgrades rather than these two major ones. The details and estimated costs of these upgrades are not yet available. The 2035 mapping results exceedance of the two constraints is larger, increasing the likelihood that the major upgrades identified in the CAISO's

2021 White Paper will be needed. Thus, the resources mapped to substations impacted by these exceedances are noted as in-compliance with the transmission criteria in Table 20 and Table 21 above.

The third constraint, Humboldt-Trinity 115 kV Line, exceedance cannot be fully alleviated by the CAISO's 2021 White Paper upgrade, so the resources mapped to substations impacted by this constraint in Table 21 remain at level-3 non-compliance. The 22-23 TPP preliminary results indicate the potential need for a minor upgrade for a similar set of mapped resources.

Finally, the RESOLVE selected Humboldt offshore wind mapped to a proposed new 500 kV Humboldt substation would require a major new transmission upgrade. In the 21-22 TPP offshore wind sensitivity, the CAISO identified three potential transmission solutions and is again studying potential solutions for the Humboldt offshore wind included in the 22-23 TPP sensitivity portfolio. Although the $2.3 billion overland AC transmission upgrade was used as the upgrade option in the RESOLVE model, it was selected as a placeholder upgrade and not intended to indicate a CPUC preferred upgrade option. Additional CPUC staff modeling results with RESOLVE suggest that any of the three options identified in the 21-22 TPP sensitivity study would likely be cost-effective based on the cost estimates of each upgrade.

7.2 Southern PG&E Mapping Results

Mapped Resources Summary

Table 22 summarizes the final mapped resources in the Southern PG&E area after post-ruling mapping adjustments.

Table 22: Summary of mapped resources in the Southern PG&E area.

Upated Resources in Southern PG&E											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	4	-	7	-	-	-	11	-	**11**
Geothermal	-	-	-	-	-	-	-	-	-	-	**-**
Distributed Solar	-	-	31	-	21	-	-	-	52	-	**52**
Utility-Scale Solar	561	87	1,192	390	2,025	1,859	345	2,402	4,123	4,738	**8,861**
Wind	-	-	175	-	328	-	-	-	504	-	**504**
Offshore Wind	-	-	-	-	3,100	-	-	-	3,100	-	**3,100**
Li_Battery	930	-	1,617	-	569	-	2,088	-	5,204	-	**5,204**
LDES	-	-	-	-	-	-	300	-	300	-	**300**

Busbar Mapping Criteria Compliance

Table 23 and Table 24 depict the final busbar mapping criteria alignment for non-storage and storage resources in 2035, respectively, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the 2033 mapped resources are in the 2033 Dashboard.

Table 23: Summary of the 2035 mapped renewable resources in Southern PG&E by substation and the compliance of these allocations with the busbar mapping criteria

2035 Mapping: In-Development and Generic Resources						Busbar Mapping Criteria Compliance						
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	Co-located w/ mapped storage
Alpaugh	115	Solar	20	125	145	1	2	1	1	2	1	Yes
Arco	230	Solar	130	521	651	1	3	1	1	1	1	Yes
Borden	230	Solar	100	100	200	1	3	1	1	2	1	
Cabrillo	115	In-State Wind	99	-	99	1	2	1	2	1	1	
Caliente	230	Solar	100	-	100	1	3	1	1	1	1	
Caliente	230	In-State Wind	180	-	180	3	3	2	1	1	1	
Cholame	70	In-State Wind	-	-	-	2	3	1	1	1	3	
Diablo	500	Offshore Wind	3,100	-	3,100	N/A	1	N/A	N/A	2	1	
Gates	230	Solar	1,050	650	1,700	1	3	1	1	2+	1	Yes
Gregg	230	Solar	50	105	155	1	2	1	1	2	1	Yes
Helm	230	Solar	120	95	215	1	2	1	1	2	1	Yes
Henrietta	115	Solar	25	95	120	1	2	1	1	2	1	Yes
Lamont	115	Solar	50	100	150	1	3	1	1	1	1	
Le Grand	115	Solar	60	59	119	1	2	1	1	2	1	
Los Banos	230	Solar	300	200	500	1	3	1	1	1	1	Yes
Los Banos	230	In-State Wind	150	-	150	1	3	1	1	1	2	
McCall	230	Solar	-	-	-	1	2*	1	1	1	3	
Midway	230	Solar	50	200	250	1	3	1	2	1	1	Yes
Midway	500	Solar	50	750	800	1*	2*	1	2	1	1	Yes
Midway	115	Solar	200	-	200	1	3	1	2	1+	1	
Morro Bay (Propo:	500	Offshore Wind	-	-	-	N/A	1	N/A	N/A	2+	1*	
Mustang	230	Solar	100	200	300	1	3	1	1	1	1	Yes
Olive	115	Solar	40	-	40	1	3	1	1	1	1	Yes
Panoche	230	Solar	50	317	367	1	3	1	1	3	1	Yes
Rio Bravo	115	Solar	-	56	56	1	2	1	1	1	1	Yes
Solar SS	230	Solar	130	-	130	1	2	1	1	2	1	Yes
Templeton	230	In-State Wind	75	-	75	2	3	1	2	3	3	
Tranquility	230	Solar	400	700	1,100	1	3	1	1	1	1	Yes
Westley	230	Solar	227	23	250	1	3	1	1	1	1	Yes
Wheeler Ridge	115	Solar	100	75	175	1	2	1	1	1	1	Yes
Wheeler Ridge	230	Solar	210	280	490	1	3	1	1	2	1	Yes

Legend for Criteria Flags	General	Level-3 Non-compliance: 3	Level-2 Non-compliance: 2	Level-1 Compliance: 1		*Asterik after substation name indicates import into CAISO system
	General	Greyed out substation rows indicated locations that have no mapped resources but non-compliance with criteria 4 or 5	Substation: Sample Sub	MW Total: -	Criteria 4: 2	
	Criteria Specific Flags	Criteria 2:	1*	2*		Reflect the final Tx non-compliace after White Paper upgrades are applied
	Criteria Specific Flags	Criteria 4:	1+	2+	3+	Indicate non-compliance when commercial interest exceeds mapped results. 1+: Significantly more low confidence CI, more Cluster 2 CI, or more high-confidence solar EODS; 2+: Signficantly more Cluster 2 CI or more high-confidence CI; 3+: Significantly more FCDS TPD allocated
	Criteria Specific Flags	Criteria 5:	1*	2*		Adjusted compliance from staff review of impacts of deviation from previous base case

Table 24: Summary of the 2035 mapped storage resources in Southern PG&E by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources				Busbar Mapping Criteria Compliance			Additional Battery Mapping Criteria				
Substation	Voltage	Resource Type	Total (MW)	2. Tx Capability Limit	4. Commercial Interest	5. Prior Base Case	Co-located w/ mapped solar	LCR	DAC	O3 or PM2.5 non-attainment zone	High curtailment zone
Alpaugh	115	Li_Battery	70	2	2	1	Yes	0	1	1	0
Arco	230	Li_Battery	219	3	1+	1	Yes	0	1	1	0.25
Avenal	115	Li_Battery	10	2	1	1		0	1	1	0
Coburn	230	Li_Battery	6	2	1	1		0	0	0	0
Gates	500	Li_Battery	300	3	1	1		0	0	1	0
Gates	230	Li_Battery	420	3	2+	1	Yes	0	0	1	0
Gregg	230	Li_Battery	55	2	2	1	Yes	0	1	1	0
Helm	230	Li_Battery	95	2	2	1	Yes	0	1	1	0
Henrietta	115	Li_Battery	68	2	1	1	Yes	1	1	1	0
Kettleman	70	Li_Battery	10	3	1*	1		0	0	1	0
Lamont	115	Li_Battery	95	3	1	1		0	1	1	0
Los Banos	230	Li_Battery	100	3	1+	1	Yes	0	1	1	0
Los Banos	500	Li_Battery	-	1	1+	1		0	1	1	0
McCall	230	Li_Battery	-	2*	1	3		0	1	1	0
Mesa	115	Li_Battery	50	3	3	1		0	0	0	0
Mesa	230	Li_Battery	100	3	1+	1		0	0	0	0
Midway	230	Li_Battery	92	3	1	1	Yes	0	0	1	0.25
Midway	500	Li_Battery	650	2*	2+	1	Yes	0	0	1	0.25
Midway	115	Li_Battery	-	3	1+	2*		0	0	1	0.25
Morro Bay	230	Li_Battery	-	3	1+	1		0	0	0	0.25
Morro Bay	230	LDES	300	3	1	1					
Moss Landing	500	Li_Battery	350	1	3+	1		1	0	0	0.25
Moss Landing	230	Li_Battery	10	2	1	1		1	0	0	0.25
Mustang	230	Li_Battery	170	3	1+	1	Yes	1	1	1	0
Olive	115	Li_Battery	20	3	1	1	Yes	0	1	1	0
Panoche	230	Li_Battery	170	3	3	1	Yes	1	1	1	0
Rio Bravo	115	Li_Battery	55	3	1	1	Yes	0	1	1	0
Sisquoc	115	Li_Battery	10	3	1	1		0	0	0	0
Solar SS	230	Li_Battery	50	2	2	1	Yes	0	0	1	0
Taft	115	Li_Battery	3	3	1	1		0	0	1	0
Tranquility	230	Li_Battery	700	3	2+	1	Yes	0	1	1	0
Westley	230	Li_Battery	170	3	1	1	Yes	0	1	1	0
Wheeler Ridge	115	Li_Battery	157	2	1	1	Yes	0	1	1	0.25
Wheeler Ridge	230	Li_Battery	70	3	2	1	Yes	0	1	1	0.25

Legend for Criteria Flags					
General	Level-3 Non-compliance: 3	Level-2 Non-compliance: 2	Level-1 Compliance: 1		*Asterik after substation name indicates import into CAISO system
General	Greyed out substation rows indicated locations that have no mapped resources but non-compliance with criteria 4 or 5	Substation: Sample Sub	MW Total: -	Criteria 4: 2	
Criteria Specific Flags	Criteria 2:	1*	2*		Reflect the final Tx non-compliace after White Paper upgrades are applied
Criteria Specific Flags	Criteria 4:	1+	2+	3+	Indicate non-compliance when commercial interest exceeds mapped results. 1+: Significantly more low confidence CI, more Cluster 2 CI, or more high-confidence solar EODS; 2+: Signficantly more Cluster 2 CI or more high-confidence CI; 3+: Significantly more FCDS TPD allocated
Criteria Specific Flags	Criteria 5:	1*	2*		Adjusted compliance from staff review of impacts of deviation from previous base case

Transmission Implications

The mapped resources in Table 23 and Table 24 have numerous level-2 and level-3 non-compliance for transmission criteria at substations in the Southern PG&E area. In total, five actual on-peak constraints and one actual off-peak constraints from CAISO's 2021 White Paper are exceeded while six on-peak default constraints are exceeded with the 2035 mapping results. The 2033 mapping results have two fewer on-peak actual constraint exceedances but an additional off-peak actual constraint exceedance, which is alleviated by the mapping of more storage in 2035. The default constraints do not have any transmission upgrades identified in the CAISO's 2021 White Paper and may or may not require transmission upgrades to alleviate resulting in level-2 non-compliances for resources impacted by these constraints.

Two of the actual on-peak exceedances and the actual off-peak exceedance can be alleviated by the transmission upgrade identified in the CAISO's 2021 White Paper. Staff assessed these three upgrades: Midway – Gates 230kV Line $142 million upgrade for 3,140 MW of additional capacity, Gates 500/230kV Bank #13 Constraint $40 million upgrade for 4,450 MW of additional capacity, and the Moss Landing-Las Aguilas 230kV off-peak constraint $48 million upgrade for 1,300 MW of additional off-peak capacity, as cost effective. The remaining three on-peak actual constraint exceedances are still in non-compliance because the exceedance remains after accounting for the additional capacity from the three identified upgrades. Those three upgrades are the Wilson-Storey-Borden #1 & #2 230 kV Lines upgrade costing $232 million for 96 MW of capacity, the Tesla-Westley 230kV Line upgrade costing $90 million for 114 MW of capacity, and the Morro Bay-Templeton 230kV Line upgrade costing $1,250 million for 738 MW of capacity. These exceedances are kept at level-3 non-compliance because they may require additional transmission upgrades. Full analysis in the TPP studies could also show the identified upgrades to be sufficient. In contrast to these White Paper exceedances, the 22-23 TPP preliminary results for the sensitivity portfolio, which has a comparable number of resources in similar locations, indicate that several smaller upgrades and reconductoring on top of the upgrades approved in the 21-22 TPP would likely alleviate transmission exceedances throughout this area. The details and estimated costs of these upgrades identified in the preliminary 22-23 TPP results are not yet available.

Following internal busbar Working Group discussions, the 3,100 MW of Morro Bay wind was mapped as interconnecting to the Diablo Canyon 500 kV substation, but the resources could also interconnect to the proposed new 500 kV Morro Bay substation (costing ~$110 million). As was done for the 22-23 TPP, CPUC staff ask that the CAISO also consider a new Morro Bay substation as an alternative interconnection for some or all the Morro Bay offshore wind. Staff, also, did not relocate the LDES resources mapped to the Morro Bay 230 kV substation in 2035 although stakeholders raised concerns about such resources conflicting with the transmission needs of the offshore wind. Since staff mapped the offshore wind resources to the 500 kV system, CAISO staff noted that the 230 kV system would likely not be impacted by resources mapped to the 500 kV system in the area and vice versa.

Overall, the Southern PG&E area has the most discrepancy between transmission utilization and upgrades identified in RESOLVE, in the busbar mapping, and in the TPP studies themselves. CPUC staff is working with CAISO staff to update transmission constraint and upgrade information using the most recent Cluster 14 studies and information on approved upgrades from recent TPP studies for use in future mapping and modeling efforts to reduce these large discrepancies between the steps of the transmission planning process.

7.3 Greater Tehachapi Mapping Results

Mapped Resources Summary

Table 25 summarizes the total resources mapped to the Greater Tehachapi area after post-ruling mapping adjustments.

Table 25: Summary of mapped resources in the Greater Tehachapi area.

Updated Resources in Greater Tehachapi												
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	-	-	9	-	-	-	9	-	**9**
Distributed Solar	-	-	6	-	-	-	-	-	6	-	**6**
Utility-Scale Solar	718	10	1,045	600	2,382	1,922	-	205	4,146	2,738	**6,883**
Wind	218	-	3	-	124	-	-	-	345	-	**345**
Li_Battery	572	-	1,701	-	573	-	822	-	3,668	-	**3,668**
LDES	-	-	-	-	500	-	-	-	500	-	**500**

Busbar Mapping Criteria Compliance

Table 26 depicts the final busbar mapping criteria alignment for resources in 2035 mapped to the Tehachapi area, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the 2033 mapped resources are in the 2033 Dashboard.

Transmission Implications

The final mapping results for 2033, post ruling mapping adjustments, resulted in no exceedance of the CAISO's 2021 White Paper transmission constraints in the Greater Tehachapi area; but 2035 mapping results identified transmission exceedance, which can be alleviated by the CAISO's 2021 White Paper upgrade. Working group staff identified this $15 million upgrade, which expands capacity on the Antelope – Vincent Constraint by an estimated 2,700 MW, as cost-effective given the amount of resources mapped and exceedance size. Thus, the resources mapped to substations impacted by the exceedance are noted as in-compliance with the transmission criteria in the table above.

Table 26: Summary of the 2035 mapped resources (storage and non-storage) in the Greater Tehachapi area by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources						Busbar Mapping Criteria Compliance						Additional Battery Mapping Criteria				
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	LCR	DAC	O3 non-attainment zone	PM2.5 non-attainment zone	High curtailment zone
Antelope	230	Li_Battery	197	-	197	N/A	1*	N/A	N/A	1	2	1	1	1	1	0.25
Antelope	230	Solar	770	402	1,172	1	1*	1	1	2	1	1	1	1	1	0.25
Antelope	230	In-State Wind	3	-	3	2	1*	1	3	1	1	1	1	1	1	0.25
Pastoria	230	Li_Battery	80	-	80	N/A	1*	N/A	N/A	1	1	0	0	1	1	0
Pastoria	230	Solar	40	67	107	1	1*	1	1	1	1	0	0	1	1	0
Rector	230	Solar	100	100	200	1	1*	1	1	2	1	1	0	1	1	0
Springville	230	Solar	200	-	200	1	1*	1	1	2	1	0	1	1	1	0
Vestal	230	Li_Battery	350	-	350	N/A	1*	N/A	N/A	1+	1	1	1	1	1	0
Vestal	230	Solar	238	511	749	1	1*	1	1	1	1	1	1	1	1	0
Whirlwind	230	Li_Battery	959	-	959	N/A	1*	N/A	N/A	1	1*	0	0	1	0	0.25
Whirlwind	230	Solar	746	579	1,325	1	1*	1	2	2	1	0	0	1	0	0.25
Whirlwind	230	In-State Wind	101	-	101	1	1*	1	2	1	1	0	0	1	0	0.25
Whirlwind	230	LDES	500	-	500	N/A	1*	N/A	N/A	1	1	0	0	1	0	0.25
Windhub	500	Li_Battery	472	-	472	N/A	1*	N/A	N/A	2+	1	0	0	1	0	0.25
Windhub	500	Solar	780	-	780	1*	1*	1	1	1	1	0	0	1	0	0.25
Windhub	230	Li_Battery	1,039	-	1,039	N/A	1*	N/A	N/A	3+	1	0	0	1	0	0.25
Windhub	230	Solar	553	1,068	1,621	1	1*	1	1	1	1	0	0	1	0	0.25
Windhub	230	In-State Wind	23	-	23	2	1*	1	1	1	2	0	0	1	0	0.25

Legend for Criteria Flags						
General	Level-3 Non-compliance	3	Level-2 Non-compliance	2	Level-1 Compliance	1
	Greyed out substation rows indicated locations that have no mapped resources but non-compliance with criteria 4 or 5	Substation: Sample Sub	MW Total: -	Criteria 4: 2		*Asterik after substation name indicates import into CAISO system
Criteria Specific Flags	Criteria 2:	1*	2*		Reflect the final Tx non-compliace after White Paper upgrades are applied	
	Criteria 4:	1+	2+	3+	Indicate non-compliance when commercial interest exceeds mapped results. 1+: Significantly more low confidence CI, more Cluster 2 CI, or more high-confidence solar EODS; 2+: Signficantly more Cluster 2 CI or more high-confidence CI; 3+: Significantly more FCDS TPD allocated	
	Criteria 5:	1*	2*		Adjusted compliance from staff review of impacts of deviation from previous base case	

7.4 Greater LA Metro Mapping Results

Mapped Resources Summary

Table 27 summarizes the final mapped resources in the Greater LA area, which includes most of Orange County and southern portions of Ventura and Santa Barbara Counties, after post-ruling mapping adjustments.

Table 27: Summary of mapped resources in the Greater LA Metro area.

Updated Resources in Greater LA Metro												
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	2	-	3	-	1	-	-	-	6	-	**6**
Distributed Solar	-	-	20	-	-	-	-	-	20	-	**20**
Utility-Scale Solar	-	-	-	1	-	1,350	125	425	125	1,776	**1,901**
Li_Battery	266	-	1,781	-	1,269	-	1,265	-	4,580	-	**4,580**

Busbar Mapping Criteria Compliance

Table 28 depicts the final busbar mapping criteria alignment for resources in 2035 mapped to the Greater LA area, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the resources mapped in 2033 are in the 2033 Dashboard.

Transmission Implications

The final mapped results did not trigger any transmission exceedances in the constraints incorporated from the CAISO's 2021 White Paper in either 2033 or 2035. The 22-23 TPP sensitivity portfolio preliminary results, however, indicate the potential need for several upgrades with a total estimated cost of $800 – 900 million. This base case portfolio has roughly 500 MW more resources in the Greater LA Metro area in 2035 than the 22-23 TPP sensitivity indicating that further upgrades may be necessary.

Table 28: Summary of the 2035 mapped resources (storage and non-storage) in the Greater LA Metro area by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources						Busbar Mapping Criteria Compliance						Additional Battery Mapping Criteria				
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	LCR	DAC	O3 non-attainment zone	PM2.5 non-attainment zone	High curtailment zone
Alamitos	230	Li_Battery	82	-	82	N/A	1	N/A	N/A	1	1	0	0	1	1	0
Barre	230	Li_Battery	20	-	20	N/A	1	N/A	N/A	1	1	1	1	1	1	0
Capistrano	138	Li_Battery	250	-	250	N/A	1	N/A	N/A	1	1	1	0	1	1	0
Chino	230	Li_Battery	30	-	30	N/A	1	N/A	N/A	1	1	1	0	1	1	0
Etiwanda	230	Li_Battery	200	-	200	N/A	1	N/A	N/A	1	1	1	1	1	1	0
Goleta	230	Li_Battery	50	-	50	N/A	1	N/A	N/A	1	1	0	0	0	0	0
Hinson	230	Li_Battery	300	-	300	N/A	1	N/A	N/A	2	1	0	1	1	1	0
Johanna	230	Li_Battery	80	-	80	N/A	1	N/A	N/A	1	1	1	1	1	1	0
Laguna Bell	230	Li_Battery	500	-	500	N/A	1	N/A	N/A	1	1	0	1	1	1	0
Lighthipe	230	Li_Battery	100	-	100	N/A	1	N/A	N/A	1	1	0	1	1	1	0
Mandalay	230	Li_Battery	-	-	-	N/A	1	N/A	N/A	1+	1	0	1	1	0	0
Mira Loma	230	Li_Battery	300	-	300	N/A	1	N/A	N/A	1+	1	0	1	1	1	0
Moorpark	230	Li_Battery	500	-	500	N/A	1	N/A	N/A	1+	1	1	0	1	0	0
Moorpark	230	Solar	-	500	500	1	1	1	1	1	1	1	0	1	0	0
Padua	230	Li_Battery	124	-	124	N/A	1	N/A	N/A	1	1	0	0	1	1	0
Pardee	230	Li_Battery	95	-	95	N/A	1	N/A	N/A	1	1	0	0	1	1	0
Rio Hondo	230	Li_Battery	50	-	50	N/A	1	N/A	N/A	2	1	0	0	1	1	0
Santa Clara	230	Li_Battery	30	-	30	N/A	1	N/A	N/A	1	1	0	0	1	0	0
Santa Clara	230	Solar	125	125	250	1	1	1	1	3	1	0	0	1	0	0
Talega	230	Li_Battery	100	-	100	N/A	1	N/A	N/A	1	1	0	0	1	0	0
Vincent	230	Li_Battery	1,254	-	1,254	N/A	1	N/A	N/A	2+	1	0	0	1	0	0.25
Vincent	230	Solar	-	1,151	1,151	1	1	1	1	1	1	0	0	1	0	0.25
Walnut	230	Li_Battery	250	-	250	N/A	1	N/A	N/A	1	2	1	1	1	1	0

The meanings and implications of the criteria flags are consistent with the legends included with the prior criteria summaries in Table 24and Table 26.

7.5 Greater Kramer Mapping Results

Mapped Resources Summary

Table 29 summarizes the final mapped resources in the Greater Kramer area after post-ruling mapping adjustments.

Table 29: Summary of mapped resources in the Greater Kramer area.

Updated Resources in Greater Kramer											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	3	-	-	-	-	-	3	-	**3**
Geothermal	40	-	-	-	-	-	-	-	40	-	**40**
Geothermal OOS	-	-	13	-	-	-	-	-	13	-	**13**
Distributed Solar	-	-	5	-	2	-	-	-	7	-	**7**
Utility-Scale Solar	100	-	625	550	585	450	-	350	1,310	1,350	**2,660**
Li_Battery	50	-	700	-	415	-	239	-	1,404	-	**1,404**

Busbar Mapping Criteria Compliance

Table 30 depicts the final busbar mapping criteria alignment for resources in 2035 mapped to the Greater Kramer area, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the resources mapped in 2033 are in the 2033 Dashboard.

Transmission Implications

One CAISO's 2021 White Paper transmission constraints in the Greater Kramer area is exceeded by the resources mapped in 2033, while all three constraints are exceeded in 2035. The Kramer-Victor/Roadway -Victor Constraint exceedance, in both 2033 and 2035, is alleviated by the cost-effective upgrade identified in the white paper, which costs $108 million for an estimated 430 MW on-peak capacity expansion.

The other two identified upgrades, the Victor-Lugo Constraint upgrade costing $226 million for an estimated 430 MW capacity increase and Lugo 500/230 kV Transformer Constraint costing $70 million for an estimated 980 MW capacity increase, would only alleviate small exceedances of the capability limits for the two respective constraints. The working group staff assessed that the small exceedances on their own do not make these upgrades cost effective. However, the North of Lugo area already has a complex Remedial Action Scheme (RAS) and curtailment of existing resources, as noted in the 22-23 TPP preliminary results. Additionally, the region's transmission has interactions with the East of Pisgah transmission systems and the resources mapped to the Southern Nevada & Eldorado area. These factors make the transmission upgrades in this area more cost-effective and so all the resources mapped to the substations within these constraints are marked as in-compliance with the transmission criteria as seen in Table 30. The preliminary 22-23 TPP results also indicate the potential need for additional and alternative transmission upgrades not identified in the CAISO's 2021 White Paper.

Table 30: Summary of the 2035 mapped resources (storage and non-storage) in the Greater Kramer area by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic						Busbar Mapping Criteria Compliance						Additional Battery Mapping Criteria			
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	LCR	DAC	O3 non-attainment zone	High curtailment zone
Calcite	230	Li_Battery	200	-	200	N/A	1*	N/A	N/A	1	2	0	0	1	0
Calcite	230	Solar	200	250	450	1	1*	1	1	1	1	0	0	1	0
Control*	115	Geothermal	13	-	13	N/A	1*	N/A	N/A	1	1	0	0	0	0
Coolwater	115	Li_Battery	104	-	104	N/A	1*	N/A	N/A	1+	1	0	1	1	0
Coolwater	115	Solar	150	200	350	1	1*	1	2	1	1	0	1	1	0
Coolwater	115	In-State Wind	-	-	-	1	1*	2	2	1+	1	0	1	1	0
Kramer	230	Li_Battery	700	-	700	N/A	1*	N/A	N/A	1+	1	0	0	1	0
Kramer	115	Li_Battery	75	-	75	N/A	1*	N/A	N/A	1	1	0	0	1	0
Kramer	230	Solar	615	550	1,165	2	1*	1	2	1	1	0	0	1	0
Kramer	115	Solar	95	-	95	1	1*	1	2	1	1	0	0	1	0
Pisgah	230	Li_Battery	125	-	125	N/A	1*	N/A	N/A	2	1	0	1	1	0
Pisgah	230	Solar	100	200	300	2	1*	1	1	2	1	0	1	1	0
Roadway	115	Li_Battery	150	-	150	N/A	1*	N/A	N/A	1	2	0	1	1	0
Roadway	115	Solar	50	150	200	1	1*	1	2	1	2	0	1	1	0
Victor	230	Solar	-	-	-	1	1*	1	2	1	3	0	0	1	0

Legend for Criteria Flags						
General	Level-3 Non-compliance: 3	Level-2 Non-compliance: 2	Level-1 Compliance: 1			*Asterik after substation name indicates import into CAISO system
General	Greyed out substation rows indicated locations that have no mapped resources but non-compliance with criteria 4 or 5	Substation: Sample Sub	MW Total: -	Criteria 4: 2		
Criteria Specific Flags	Criteria 2:	1*	2*		Reflect the final Tx non-compliace after White Paper upgrades are applied	
Criteria Specific Flags	Criteria 4:	1+	2+	3+	Indicate non-compliance when commercial interest exceeds mapped results. 1+: Significantly more low confidence CI, more Cluster 2 CI, or more high-confidence solar EODS; 2+: Signficantly more Cluster 2 CI or more high-confidence CI; 3+: Significantly more FCDS TPD allocated	
Criteria Specific Flags	Criteria 5:	1*	2*		Adjusted compliance from staff review of impacts of deviation from previous base case	

*Resources mapped to this substation are outside of the CAISO's BAA.

The Greater Kramer area includes 13 MW Northern Nevada geothermal mapped at the Control 115 kV substation and utilizing the Silver Peak 55 kV intertie into the CAISO. The preliminary 22-23 TPP results indicated that a larger amount geothermal exceed the capacity on that intertie; however, it is currently unclear whether the amount mapped will exceed available transmission capacity. If this small amount of geothermal would require significant upgrades, the more cost-effective option would likely be to shift the resources to a different import intertie.

7.6 Southern Nevada and El Dorado Mapping Results

Mapped Resources Summary

Table 31 summarizes the final mapped resources in the Southern Nevada and El Dorado area, including the Mohave substation, after post-ruling mapping adjustments. This area includes out-of-state and out-of-CAISO resources: Northern Nevada Geothermal, Wyoming Wind, and Idaho Wind mapped as entering the CAISO at interties in the Southern Nevada region.

Table 31: Summary of mapped resources in the Southern Nevada and El Dorado area.

Updated Resources in Southern Nevada											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Geothermal	-	-	-	-	500	-	-	-	500	-	**500**
Geothermal OOS*	-	-	76	-	255	-	74	-	405	-	**405**
Utility-Scale Solar	-	-	260	240	1,683	1,791	214	755	2,157	2,786	**4,943**
Wind	-	-	-	-	403	-	-	-	403	-	**403**
OOS Wind, New Tx	-	-	-	-	2,500	-	-	-	2,500	-	**2,500**
OOS Wind, Ext Tx	571	100	-	-	-	-	-	-	571	100	**671**
Li_Battery	-	-	428	-	1,422	-	839	-	2,689	-	**2,689**

Busbar Mapping Criteria Compliance

Table 32 depicts the final busbar mapping criteria alignment for resources in 2035 mapped to the Southern Nevada area, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the resources mapped in 2033 are in the 2033 Dashboard.

Transmission Implications

For both 2033 and 2035 mapping results, two of the area's CAISO's 2021 White Paper transmission constraints with default capacity limits, the GLW-VEA Area Constraint and the Mohave/Eldorado 500 kV Constraint, are exceeded by the mapping results, which results in level-2 non-compliances. The CAISO's 2021 White paper identified transmission upgrade for the GLW-VEA Area Constraint was approved in the 21-22 TPP, so there is currently no identified transmission upgrade for that constraint or the Mohave/Eldorado Constraint. The third constraint, Eldorado 500/230 kV Transformer #5 Constraint, is not exceeded so substations within it are marked with the in-compliance flag.

Table 32: Summary of the 2035 mapped resources (storage and non-storage) in the Southern Nevada area by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources						Busbar Mapping Criteria Compliance						Additional Battery Mapping Criteria			
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	LCR	DAC	O3 or PM2.5 non-attainment zone	High curtailment zone
Beatty	138	Geothermal	500	-	500	3	2	N/A	N/A	2	1	0	0	0	0
Carpenter Canyon	230	Li_Battery	200	-	200	N/A	2	N/A	N/A	1	1	0	0	0	1
Carpenter Canyon	230	Solar	250	215	465	1	2	1	N/A	2	1	0	0	0	1
Desert View	230	Li_Battery	40	-	40	N/A	2	N/A	N/A	2	1	0	0	1	0.25
Desert View	230	Solar	100	50	150	1	2	1	N/A	2	1	0	0	1	0.25
Eldorado	230	Li_Battery	529	-	529	N/A	1	N/A	N/A	1	1	0	0	0	1
Eldorado	230	Solar	-	300	300	2	1	1	N/A	1	1	0	0	0	1
Eldorado	230	Geothermal, OOS	100	-	100	N/A	1	N/A	N/A	2	1	0	0	0	1
Eldorado	500	Geothermal, OOS	305	-	305	N/A	2	N/A	N/A	2	1	0	0	0	1
Eldorado	500	OOS Wind, New Tx	2,500	-	2,500	N/A	2	N/A	N/A	1	1				
Innovation	230	Li_Battery	150	-	150	N/A	2	N/A	N/A	1	1	0	0	0	0.25
Innovation	230	Solar	237	65	302	1	2	1	N/A	1	2	0	0	0	0.25
Innovation	230	In-State Wind	93	-	93	2	2	1	N/A	3	2	0	0	0	0.25
Ivanpah	230	Li_Battery	-	-	-	N/A	1	N/A	N/A	2+	1	0	1	0	0
Lathrop	138	Li_Battery	200	-	200	N/A	2	N/A	N/A	2	1	0	0	0	0
Lathrop	138	Solar	150	350	500	1	2	1	N/A	2	1	0	0	0	0
Mohave	500	Li_Battery	700	-	700	1*	2	N/A	N/A	3+	1	0	0	0	1
Mohave	500	Solar	520	700	1,220	1*	2	1	N/A	2+	1	0	0	0	1
Sloan Canyon	230	In-State Wind	310	-	310	2	2	2	N/A	1	1	No Data	No Data	No Data	No Data
Trout Canyon	230	Li_Battery	830	-	830	N/A	2	N/A	N/A	2+	1	0	0	0	0.25
Trout Canyon	230	Solar	650	1,106	1,756	2	2	1	N/A	1+	1	0	0	0	0.25
Valley (VEA)	138	Li_Battery	40	-	40	N/A	2	N/A	N/A	1	1	1	0	0	0
Valley (VEA)	138	Solar	50	-	50	1	2	1	N/A	1	1	1	0	0	0
Vista (VEA)	138	Solar	200	-	200	1	2	1	N/A	2	1	0	0	0	0

The meanings and implications of the criteria flags are consistent with the legends included with the prior criteria summaries in Table 30.

Preliminary results for the 22-23 TPP sensitivity portfolio indicate that the resources mapped to this area and the OOS resources imported into this area will likely need several upgrades including a major transmission upgrade along the Lugo-Victorville-Eldorado 500 kV transmission system. The preliminary 22-23 TPP identified several potential alternatives for upgrades in the GLW-VEA Area Constraint and the major transmission upgrade likely needed for the whole region. The GLW area constraint potential upgrades estimated costs range from $250 - $486 million and the potential major 500 kV transmission upgrade alternatives could cost between $2 - 2.8 billion.

7.7 Riverside & Arizona Mapping Results

Mapped Resources Summary

Table 33 summarizes the final mapped resources in the Riverside area and areas of Arizona linked to the CAISO BAA. This area includes out-of-state and out-of-CAISO New Mexico Wind resource mapped as entering the CAISO at Palo Verde intertie.

Table 33: Summary of mapped resources in the Riverside and Arizona areas.

Updated Resources in Riverside & Arizona												
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Biomass/gas	-	-	3	-	-	-	-	-	3	-	**3**
Utility-Scale Solar	786	796	724	1,463	1,998	3,883	-	1,340	3,508	7,482	**10,990**
Wind	106	-	-	-	1	20	-	-	107	20	**127**
OOS Wind, Ext Tx	119	-	-	-	-	-	-	-	119	-	**119**
OOS Wind, New Tx	-	-	-	-	2,328	-	-	-	2,328	-	**2,328**
Li_Battery	1,192	-	3,476	-	1,307	-	550	-	6,524	-	**6,524**
LDES	-	-	-	-	524	-	476	-	700	-	**700**

Busbar Mapping Criteria Compliance

Table 34 depicts the final busbar mapping criteria alignment for resources in 2035 mapped to the Riverside and Arizona areas, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the resources mapped in 2033 are in the 2033 Dashboard.

Table 34: Summary of the 2035 mapped resources (storage and non-storage) in the Riverside and Arizona areas by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources						Busbar Mapping Criteria Compliance						Additional Battery Mapping Criteria			
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	LCR	DAC	O3 or PM2.5 non-attainment zone	High curtailment zone
Colorado River	500	Li_Battery	-	-	-	N/A	3	N/A	N/A	1	1*	0	0	0	0.25
Colorado River	230	Li_Battery	741	-	741	N/A	3	N/A	N/A	2+	1	0	0	0	0.25
Colorado River	500	Solar	335	165	500	2	3	1	1	2	2	0	0	0	0.25
Colorado River	230	Solar	569	1,295	1,864	2	3	1	1	1+	1	0	0	0	0.25
Delaney	500	Li_Battery	1,107	-	1,107	1*	3	N/A	N/A	2+	1	0	0	1	0.25
Delaney	500	Solar	1,000	2,000	3,000	1*	3	1	N/A	2+	1	0	0	1	0.25
Devers	230	Li_Battery	445	-	445	N/A	3	N/A	N/A	2+	1	1	0	1	0
Devers	230	Solar	150	425	575	1	3	1	2	1	1	1	0	1	0
Devers	230	In-State Wind	1	20	21	2	3	1	1	2+	1	1	0	1	0
El Casco	230	Li_Battery	165	-	165	N/A	3	N/A	N/A	1	1	0	0	1	0
Hassayampa	500	Li_Battery	20	-	20	1*	3	N/A	N/A	2+	2*	0	0	1	0.25
Hassayampa	500	Solar	300	171	471	1*	3	1	N/A	1+	2	0	0	1	0.25
Hoodoo Wash	500	Li_Battery	535	-	535	1*	3	N/A	N/A	2+	1	0	0	0	0
Hoodoo Wash	500	Solar	250	776	1,026	1*	3	1	N/A	2+	1	0	0	0	0
Lee Lake (Proposed)	500	LDES	-	-	-	N/A	1	N/A	N/A	3+	1				
Palo Verde*	500	OOS Wind, New Tx	2,328	-	2,328	N/A	3	N/A	N/A	1	1				
Redbluff	500	Li_Battery	500	-	500	1*	3	N/A	N/A	1+	1	0	0	0	0.25
Redbluff	230	Li_Battery	930	-	930	N/A	3	N/A	N/A	2+	1	0	0	0	0.25
Redbluff	500	Solar	-	900	900	1*	1	1	1	1	1	0	0	0	0.25
Redbluff	230	Solar	118	954	1,072	1	3	1	1	2	1	0	0	0	0.25
Redbluff	500	LDES	700	-	700	N/A	3	N/A	N/A	2+	1				
Valley	500	Li_Battery	690	-	690	1*	3	N/A	N/A	1+	1	1	0	0	0
Vista	230	Li_Battery	200	-	200	N/A	3	N/A	N/A	1	1	0	1	1	0

The meanings and implications of the criteria flags are consistent with the legends included with the prior criteria summaries in Table 30.
*Resources mapped to this substation are outside of the CAISO's BAA.

Transmission Implications

All three CAISO's 2021 White Paper constraints impacting mapped resources in the Riverside and Arizona areas are exceeded in the on-peak limits by the final mapping results for both 2033 and 2035. Each constraint has an upgrade identified in the CAISO's 2021 White Paper: the Serrano – Alberhill – Valley 500 kV Constraint upgrade, which costs $ 1.48 billion for an additional 3,648 MW of capacity, the Devers – Red Bluff 500 kV Constraint upgrade, which costs $1.02 billion for an additional 3,100 MW of on-peak capacity, and Colorado River 500/230 kV Transformer Constraint, which costs $74 million for an additional 1,000 MW of capacity. Working Group staff assessed the upgrades for all three constraints as cost-effective; however, level-3 non-compliance flags remain for nearly all the mapped resources in Table 34 because the exceedance of the Serrano – Alberhill – Valley 500 kV Constraint is greater than the capacity of the upgrade identified in the CAISO's 2021 White Paper. The 22-23 TPP preliminary results for the sensitivity portfolio indicated these upgrades combined with an additional series of reconductoring and smaller upgrades costing an estimated $420 million may likely alleviated the exceedances observed in the mapping results.

For most of the resources mapped in the Imperial Irrigation District's (IID's) BAA including Imperial Geothermal, staff selected the IID-SCE intertie at the Mirage 230 kV substation as the import point into the CAISO, and thus are included within these transmission constraints. Additional transmission upgrade implications of these resources are discussed further in Section 7.8 on San Diego and Imperial Mapping Results. The resources mapped to the Arizona area particularly at the Hoodoo Wash substation also impact the San Diego and Imperial area related transmission constraints. These impacts are also discussed in Section 7.8 below.

7.8 San Diego & Imperial Mapping Results

Mapped Resources Summary

Table 35 summarizes the final mapped resources in the San Diego and Imperial areas. The Imperial area includes resources mapped within the Imperial Irrigation District's (IID's) BAA., although a significant portion of these resources are imported into the CAISO system in the Riverside area discussed in the previous section.

Table 35: Summary of mapped resources in the San Diego and Imperial areas.

Updated Resources in San Diego & Imperial											
Resource Type	Online Resources (by 8/1/2022)		In-Development Resources		2033 Generic Resources		2035 Additional Resources		Total Resources (2035)		
	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	FCDS	EODS	TOTAL
Geothermal, IID	-	-	76	-	724	-	100	-	900	-	**900**
Utility-Scale Solar	20	-	-	410	100	163	-	270	120	843	**963**
Wind	105	-	-	-	135	360	-	-	240	360	**600**
Li_Battery	399	-	1,201	-	85	-	141	-	1,827	-	**1,827**
LDES	-	-	-	-	500	-	-	-	500	-	**500**

Busbar Mapping Criteria Compliance

Table 36 depicts the final busbar mapping criteria alignment for resources in 2035 mapped to the San Diego and Imperial areas, following post-ruling mapping adjustments. Details on the remaining non-compliance flags are in the 2035 Dashboard and details on the resources mapped in 2033 are in the 2033 Dashboard.

Transmission Implications

The post-ruling mappings in both 2033 and 2035 result in three on-peak constraint exceedances in the San Diego and Imperial areas that can be alleviated by the CAISO's 2021 White Paper identified upgrades. Working group staff identified all three upgrades: the Encina-San Luis Rey Constraint upgrade costing $102 million for an estimated 3,700 MW of additional capacity, the San Luis Rey-San Onofre Constraint upgrade costing and estimated $237 million for an estimated 4,260 MW of additional capacity, and the San Diego Internal Constraint upgrade costing $90 million for an estimated 2,000 MW of additional capacity, as cost effective.

The Imperial area has an additional exceedance of the East of Miguel Area constraint in the on-peak limit for 2033 mapping and the on- and off-peak limits for the 2035 mapping, which also impacts some of the resources mapped to Arizona. In 2033 the exceedance is primarily driven by the additional resources mapped to Hoodoo Wash substation in Arizona, but additional solar and storage mapped to other substations in Imperial increases the exceedance in the 2035 results. Furthermore, the mapping assumes only 50 MW of new geothermal being exported from IID's BAA at the SDGE-IID intertie with rest going to the SCE-IID intertie. If additional geothermal were to interconnect at the SDGE-IID intertie rather than the SCE-IID intertie, it would further increase the exceedance.

The resources under the East of Miguel constraint have a level 3 non-compliance flag because the CAISO's 2021 White Paper upgrade, given its estimated capacity and costs assumptions (1,400 MW and $3.68 billion), is not cost-effective considering just the resources on their own. However, the preliminary results for the 22-23 TPP sensitivity portfolio, which has a similar exceedance, indicate potential benefits of a similar upgrade to the Riverside, Arizona, and San Diego areas in addition to just the resources in the Imperial area. The CAISO's 2021 White paper upgrade also has the potential enable more geothermal in the Salton Sea and Imperial areas to intercoonet. The preliminary 22-23 TPP results also identified an alternative series of upgrades to mitigate the overloads that may have lower costs than the identified White Paper upgrade, but the estimated costs of those transmission solutions were not yet fully identified in the preliminary results. With that uncertainty, the various overall transmission solutions to alleviate exceedances in the San Diego and Imperial areas could potentially range in cost from more than $1.4 billion to more than $3.9 billion.

Table 36: Summary of the 2035 mapped resources (storage and non-storage) in the San Diego and Imperial areas by substation and the compliance of these allocations with the busbar mapping criteria.

2035 Mapping: In-Development and Generic Resources						Busbar Mapping Criteria Compliance						Battery Mapping Criteria		
Substation	Voltage	Resource Type	FCDS (MW)	EODS (MW)	Total (MW)	1. Dist. to Tx of Approp. Voltage	2. Tx Capability Limit	3a. Available Land Area	3b. Env. Impacts	4. Commercial Interest	5. Prior Base Case	LCR	DAC	O3 or PM2.5 non-attainment zone
ECO	115	Li_Battery	108	-	108	N/A	3	N/A	N/A	1	1	1	0	1
ECO	115	Solar	-	180	180	1	3	2	1	1	1	1	0	1
ECO	230	In-State Wind	-	360	360	2	3	N/A	N/A	2+	2	1	0	1
ECO	115	In-State Wind	135	-	135	1	3	2	1	1+	1	1	0	1
ECO	500	In-State Wind	-	-	-	2	3	N/A	N/A	2+	1	1	0	1
Encina	115	Li_Battery	-	-	-	N/A	1*	N/A	N/A	1+	2*	0	0	1
Escondido	230	Li_Battery	150	-	150	N/A	1*	N/A	N/A	1+	1	1	0	1
IID System*	230	Li_Battery	150	-	150	N/A	3	N/A	N/A	1	1	0	1	1
IID System*	230	Solar	-	100	100	N/A	1	N/A	N/A	2+	1	0	1	1
IID System*	230	Geothermal	850	-	850	1	3	1	2	2	1	0	1	1
IID System*	161	Geothermal	50	-	50	1	3	1	2	1	1	0	1	1
Imperial Valley	230	Li_Battery	205	-	205	N/A	3	N/A	N/A	2+	1	1	0	0
Imperial Valley	230	Solar	100	563	663	1	3	1	1	1+	1	1	0	0
Kearny	115	Li_Battery	10	-	10	N/A	1*	N/A	N/A	1	1	No Data	No Data	No Data
Miguel	230	Li_Battery	10	-	10	N/A	1*	N/A	N/A	1	1	0	0	1
Mission	230	Li_Battery	10	-	10	N/A	1*	N/A	N/A	1	1	0	0	1
Mission	138	Li_Battery	50	-	50	N/A	1*	N/A	N/A	1	1	0	0	1
Ocotillo	500	In-State Wind	-	-	-	2	3	2	1	2+	1	0	0	1
Otay Mesa	230	Li_Battery	75	-	75	N/A	1*	N/A	N/A	1+	1	0	0	1
San Luis Rey	230	Li_Battery	60	-	60	N/A	1*	N/A	N/A	2+	1	0	0	1
Silvergate	230	Li_Battery	200	-	200	N/A	1*	N/A	N/A	1	1	1	1	1
Sycamore	138	Li_Battery	400	-	400	N/A	1*	N/A	N/A	1	1	1	0	1
Sycamore	230	LDES	500	-	500	N/A	1*	N/A	N/A	2	1	1	0	1
Talega	230	Li_Battery	100	-	100	N/A	1	N/A	N/A	1	1	0	0	1

8. Other Assumptions for TPP

Guidance previously provided to CAISO as part of the annual CPUC portfolio transmittal was included in a document called the "Unified Inputs & Assumptions". CPUC and CAISO staff agree that any necessary content be included in this Report. This section describes the additional modeling assumptions the CPUC *provides to the CAISO's TPP, besides the portfolio and busbar mapping assumptions described in the rest of this Report.*

8.1 Thermal Generator Retirement

RESOLVE reports the aggregate amount of thermal generation not retained by resource category. Unit-specific information is not modeled. Because the TPP studies require modeling of specific units and locations, CPUC staff provide information to the CAISO regarding which units should be assumed as retired for transmission planning purposes. However, the resource portfolio for the 2023-2024 TPP does not include as an output any not retained thermal generation. Instead, the portfolio does include thermal generation retirements as an input prior to resource optimization.[13] The detailed workbook contained in Appendix E lists the specific units assumed as retired. CPUC staff applied the steps described in the methodology (see Appendix A) to develop this list.

8.2 Demand Response

This subsection provides guidance on modeling treatment of demand response (DR) programs in network reliability studies including allocating capacity from those programs to transmission substations.

The CPUC's Resource Adequacy (RA) proceeding (R. 19-11-009 or its successor R. 21-10-002) determines what resources can provide system and local resource adequacy capacity. Current RA accounting rules indicate that all existing DR programs count to the extent those program impacts are located within the relevant geographic areas being studied for system and local reliability. For its TPP studies the CAISO utilizes data from Supply-Side Resource Demand Response, which is registered in the CAISO market as either dispatchable, Emergency DR (RDRR) or Economic DR (PDR).

By nature, impacts from DR programs are distributed across large geographies. In order for these impacts to be applied in network reliability studies, DR program capacity must be allocated to transmission substations. To this end, CPUC staff requests the Investor-Owned Utilities (IOUs), in their capacity as Participating Transmission Owners (PTOs), to submit this information through the CAISO's annual TPP Study Plan stakeholder process. To the extent possible, this data should also allocate impacts of DR programs administered by CCAs or procured from third parties. Because the data requirements specified in both filings contain confidential information, the CPUC expects the CAISO and the IOUs to exchange data using their own non-disclosure agreements.

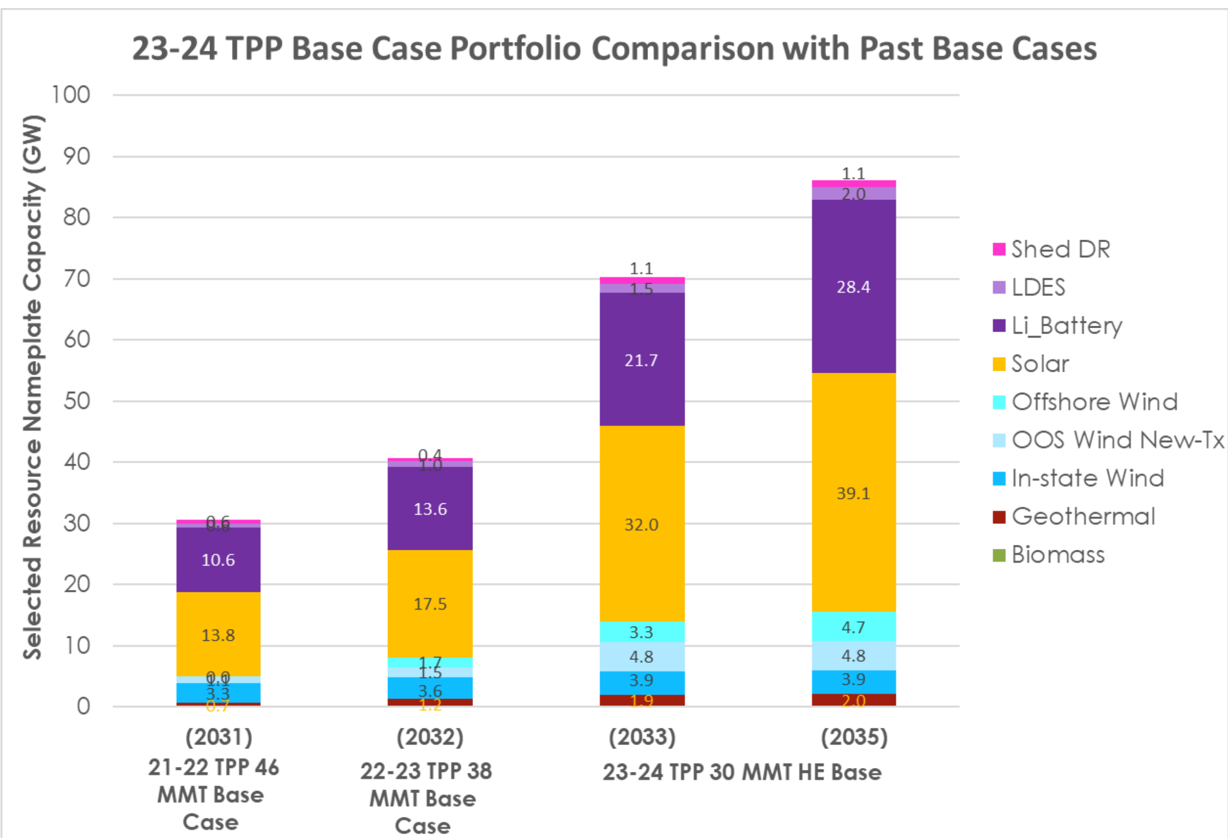
[13] The RESOLVE inputs and assumptions for this 2023-2024 TPP analysis incorporated an implementation of the High-Need Scenario of the Mid-Term Reliability Decision D.21-06-035 which included 40-year age-based retirements for peakers and CHP generators that came online by the end of 1986

9. Conclusion and Next Steps

The CPUC's policy and reliability base case portfolio has been mapped to busbars in reasonable accordance with the criteria and with consideration of state policy objectives, as described in the Methodology (see Appendix A). Staff mapped an unprecedented number of resources due to the portfolio's higher load scenario, more stringent greenhouse gas emissions target, and longer modeling outlook.

In total, the Working Group staff mapped over 54,500 MW of renewables, including 4,800 MW of out-of-state wind on new out-of-state transmission and 4,700 MW of offshore wind, and over 30,000 MW of storage, including 2,000 MW of long duration storage, in the 2035 portfolio to substations this cycle. The results of the 2033 and 2035 mapped portfolios (Appendices B and C) are transmitted to the CAISO for use in the reliability and policy-driven base case in the 2023-2024 TPP. In comparison, staff mapped 25,500 MW of renewables, including 1,500 MW of out-of-state wind and 1,700 MW of offshore wind, and over 14,500 MW of storage in the 2022-2023 TPP base case portfolio. Figure 4 **Error! Reference source not found.**compares the amount of resources mapped in this report for the base case portfolio for the 2023-2024 TPP two study years, 2033 and 2035, to the amount of resources mapped in the portfolios adopted by the CPUC as base cases for the 2021-2022 TPP and the 2022-2023 TPP.

Figure 4: Final resource comparison of the 2023-2024 TPP base case portfolio in 2033 and 2035 with the base case portfolios for the 2021-2022 and 2022-2023 TPPs.



The 2021-2022 TPP base case portfolio resulted in the identified need for six policy-driven transmission upgrades potentially costing between $1.1 – 1.5 billion within the CAISO system. The 2022-2023 TPP is still on going with the draft report scheduled for release in March 2023. However, preliminary results indicate the likely need for several major transmission upgrades beyond the $1.5-2 billion in upgrades identified as potentially needed in the 22-23 TPP Busbar Mapping Report.[14] These additional transmission upgrades stem from a significant update to the number of under-construction resources identified by Primary Transmission Owners (PTOs) and a joint CPUC-CEC July 2022 letter to study key OOS resources on top of deliverability already allocated to projects in the CAISO queue. The near doubling of resources in the 2033 base case portfolio and more than doubling in the 2035 portfolio for the 23-24 TPP results in a significant increase in the likely transmission needs of the mapped portfolio and a much greater uncertainty to the upgrades themselves and their costs needed for the mapped results. Due to the portfolio size, the amount of mapped resources exceed known transmission capacity and upgrade information in multiple locations. Therefore, staff inferred potential transmission implications from the preliminary results of the 22-23 TPP. Thus, actual transmission needs and their costs may differ significantly once the portfolios are fully studied by the CAISO. Based on these preliminary CPUC staff estimates, the 2035 mapping of the 23-24 TPP base case portfolio may need between $15 – 27 billion, including transmission needs for offshore wind and likely out-of-CAISO transmission needs for OOS wind.

Over 6,500 MW of storage was mapped to substations with DACs and over 19,000 MW of storage was mapped to substations within NO_x or ozone non-attainment zones. While RESOLVE is currently not able to model true hybrids as a potential resource, the RESOLVE updates and new transmission constraints and expressions utilized for this portfolio enabled the busbar mapping process to co-locate 22,000 MW of solar with 19,000 MW of batteries represented by mapping EODS solar and batteries to the same substations. The new transmission expressions better model the interplay between FCDS and EODS resources particularly with respect to storage. These updates capture the ability to use solar and storage together over the same transmission. By co-locating EODS solar with FCDS storage, the busbar mapping process is representing the key aspects of hybrid resources in a deconstructed fashion: utilizing the EODS solar for storage charging and preserving the FCDS transmission headroom for storage deliverability.

The final busbar mapping of resources results in numerous transmission exceedances, which are described in more detail in Section 7 above. The transmission constraint analysis conducted in busbar mapping is centered on only the CAISO's Balancing Area Authority (BAA). The transmission capability and potential upgrades needed in other BAAs are not fully known. For example, the 900 MW of geothermal resources mapped within the Imperial Irrigation District's (IID's) BAA have been assessed with CAISO transmission system at the interties where the resources would be imported from the IID's system. The impacts on the IID's system are unknown, as are the type and cost of any upgrades that may be required to successfully interconnect the resources to deliver to the CAISO border.

The grid is ever evolving and for this reason the CPUC transmits portfolios to the CAISO annually for transmission planning. A key criterion for busbar mapping is consistency with prior portfolios, particularly base cases. Thus, the Working Group strives for the mapping of resources to remain consistent with previous portfolios and to utilize the transmission upgrades already triggered in

[14] Modeling Assumptions for the 2022-2023 TPP link: https://files.cpuc.ca.gov/energy/modeling/Modeling_Assumptions_2022-2023_TPP_V.2022-2-7.pdf

previous TPPs. This consistency also helps indicate that transmission exceedances created by the mapping results for the 2023-2024 TPP portfolio could be alleviated by upgrades being studied in current ongoing 2022-2023 TPP, thereby providing an advantage to the transmission planning.

9.1 Guidance on the 30 MMT with 2021 IEPR Additional Transportation Electrification Base Case Resource Portfolio

These mapped results, as noted above, highlight the need for an amount of transmission upgrades significantly larger than identified by analysis of previous base case portfolios. As described in greater detail in Section 6.2.B, the mapped resources exceed existing transmission limits for many constraints within the CAISO system. Of the 42 constraints from the 2021 CAISO's White Paper utilized in the busbar mapping, the resources mapped in the 2035 results exceed the identified capacity of 27 constraints in either the on-peak, off-peak, or both. The mapping also results in a significant need for new transmission to interconnect North Coast offshore wind and new transmission beyond the CAISO's BAA to interconnect the OOS and out-of-BAA wind and geothermal resources to CAISO interties. In total, potential upgrades in the White Paper or the preliminary 22-23 TPP results were identified as needed for the 2035 mapping results in every area of California. CPUC staff estimate that the potential upgrades within the CAISO for the 2035 portfolio have costs estimates ranging from $9 – 19 billion. Additional new transmission needed to interconnect the offshore wind mapped could costs between $2.5 – 4.5 billion, while the new transmission beyond CAISO's borders needed for OOS wind ranges between $3 – 4 billion. CPUC staff estimate that these upgrades would provide enough transmission capacity for at least 30 – 40 GW of new resources.

For the potential transmission upgrade needs within the CAISO system, many of the identified transmission capabilities found to be exceeded are default limits within the CAISO's 2021 White Paper, so there are no identified upgrades from the White Paper. Additionally, a few of the upgrades identified do not provide enough estimated additional capacity to fully account for the number of resources mapped to substations in that constraint. Thus, in many of the exceedance situations staff have relied on the still-in-progress upgrade estimates from the 22-23 TPP preliminary results to assess the potential transmission implications of the mapped results. These limitations have led to greater uncertainty in the potential transmission upgrade impacts and costs analysis for busbar mapping. This uncertainty was driven by the large increase in the size of the portfolio mapped, which is due to the higher load assumptions and further into the future modeling year. CPUC staff plan on alleviating much of the uncertainty in the next cycle by working with the CAISO to incorporate the results of the recent Cluster 14 transmission studies and the 22-23 TPP results when completed.

If the TPP policy-driven assessment of the base portfolio identifies the need for upgrades, the CAISO would typically recommend those upgrades to the CAISO Board of Governors for approval as policy-driven transmission upgrades. The CAISO retains more flexibility with approval of projects if they are identified only in the reliability assessments, if they are identified as needed for only the 2035 mapping results, and if the estimated build time does not necessitate immediate commencement to meet the identified resource need. The CPUC will continue to coordinate with the CAISO and will be engaged in the CAISO's Transmission Planning Process by providing comments or additional guidance through the TPP stakeholder process based on results of the analysis for the base portfolio related to transmission upgrade needs that are identified.

Alignment with CAISO Queue Resources with Allocated TPD

As was done in the July 1, 2022 transmittal letter to the CAISO, CPUC staff are proposing to request that the that CAISO continue the necessary studies to inform and enable opportunities to provide Maximum Import Capability (MIC) expansion and the development of incremental transmission capacity to support the OOS and long-lead time (LLT) resources mapped in the policy- and reliability-driven base case portfolio, while preserving the existing transmission capacity that has been allocated to other projects earlier in the interconnection queue. Working Group staff sought to align the mapping with resources in the CAISO's interconnection queue that have been assigned transmission plan deliverability (TPD) while still aligning with the various other busbar mapping criteria. To that end, not all the assigned TPD in the transmission areas key to OOS and LLT resources were accounted for by mapped resources, particularly in the 2033 portfolio mapping results. CPUC staff will engage with CAISO staff to identify any TPD not already accounted for by the mapping of the portfolio's resources in these key areas. CPUC staff will compile the MW amounts and locations of these TPD resources so that the CAISO can include them in addition to the mapped portfolio resources when conducting TPP analysis.

Offshore Wind

CPUC staff recognize the need for a unique approach with offshore wind at both the North Coast and Central Coast locations. The working group mapped the 3,100 MW of Morro Bay offshore wind in both the 2033 and 2035 base case portfolios interconnecting to the existing Diablo Canyon 500 kV substation, following guidance from CAISO staff. CPUC staff request CAISO consider this mapping arrangement and the potential to connect some or all of the Morro Bay offshore wind to a proposed new 500 kV Morro Bay substation as identified in the 21-22 TPP offshore wind sensitivity portfolio results.

The base case portfolio has 161 MW of Humboldt offshore wind in 2033 and 1,607 MW in 2035. In alignment with the commercial interest currently in the CAISO's interconnection queue, the Working Group mapped the 161 MW as interconnecting with off-peak deliverability at the existing 115 kV Humboldt substation. The remaining 1,446 MW are mapped to a proposed new 500 kV Humboldt substation in the 2035 mapping results that requires new transmission to interconnect to the CAISO system. Though the RESOLVE model had to utilize one of the three North Coast upgrades identified in the 21-22 TPP offshore wind sensitivity results in its modeling of offshore, CPUC staff are not recommending that specific transmission option or any transmission option. Not identifying a specific upgrade enables the CAISO to continue to study the various transmission alternatives for interconnecting Humboldt offshore wind and incorporate results from the 22-23 TPP sensitivity, which has a similar amount of offshore wind, and the concurrent 23-24 TPP offshore wind sensitivity portfolio, which has 3,000 MW of Humboldt and 5,000 MW of additional North Coast offshore wind. CAISO staff can consider all resources mapped to a single substation to avoid significant upgrades to the existing 115 kV system solely for the small amount of offshore wind mapped.

OOS Wind

The amount of OOS wind on new transmission is significantly higher (4,828 MW in total) in this base case portfolio than in the 21-22 and 22-23 TPP base cases, which had 1,062 MW and 1,500 MW respectively. In those two previous cases, CPUC staff did not specify the location of that OOS wind or its injection location into the CAISO system. Instead, CPUC staff requested the CAISO study the impacts of the 1,062 MW in the 21-22 TPP at both the El Dorado and Palo Verde injection points with Idaho, Wyoming, and New Mexico wind all being considered. With that effort ongoing, CPUC staff made a similar request for the 22-23 TPP base case's OOS wind. CPUC staff recognize that the CAISO has folded its economic study focused on Idaho Wind, started with the 21-22 TPP request, into the currently ongoing 22-23 TPP effort. For the 4,828 MW of OOS wind in this base case, the Working Group did map the resources to specific injection points and identify specific locations as sources of the OOS wind, with 1,000 MW of Idaho Wind and 1,500 MW of Wyoming wind interconnecting at Harry Allen or El Dorado 500 kV substations and 2,328 MW of New Mexico Wind interconnecting at the Palo Verde substation.

Battery Storage-Specific Transmission Upgrades and Battery Storage as Transmission Upgrade Alternatives

As with the past two TPP portfolio submittals, the CPUC staff agree that, in some cases, more information is needed to understand the full impacts of the battery mappings, particularly in LCR areas, before new transmission projects are identified by the CAISO as needed. Accordingly, the CAISO should consult the CPUC before moving forward with any new policy-driven transmission upgrades associated specifically with storage mapping in this planning cycle. Additionally, to the extent that storage resources are required for mitigation of transmission issues identified in the CAISO's 2022-2023 Transmission Plan, CPUC staff would expect to coordinate with CAISO to enable small adjustments in the CPUC's mapping of storage resources to allow for the inclusion of this storage in the CAISO's analysis of these 2023-2024 TPP portfolios.

9.2 Offshore Wind Sensitivity Portfolio

At the time of this report, the Working Group staff have not completed mapping efforts for the one policy-driven sensitivity portfolio the CPUC will transmit to the CAISO for the 2023-2024 TPP. CPUC staff expect to transmit to the CAISO and release the mapping results for the offshore wind sensitivity portfolio in February 2023.

9.3 Busbar Mapping for 2024-25 TPP and Future Cycles

Staff appreciates the feedback and suggestions from stakeholders in response to the questions posed in the October 2022 ruling. Anything not already addressed in the transmittal for the 2023-2024 TPP will be a priority for consideration in the draft workplan for 2024-2025 TPP busbar mapping. The busbar mapping effort for the 24-25 TPP will likely feature three major changes. First, an overhaul of the environmental and land-use screens datasets utilized by the CEC in the mapping effort. Second, an expansion of time horizon for which the modeling and mapping is conducted. Per SB 887 (2022), CPUC staff will be working to provide mapped portfolios out to a fifteen-year planning horizon. Third, CPUC staff will work with CAISO staff to incorporate the recent Cluster 14 GIDAP transmission studies and the future 22-23 TPP study results into an updated white paper for use in CPUC's modeling and mapping efforts. Furthermore, CPUC staff continue to strive to resolve the process alignment and timing issues that make it challenging to inform resource busbar mapping for an upcoming TPP with the results of the ongoing TPP.

10. Appendices

A. Methodology for Resource-to-Busbar Mapping & Assumption for the TPP

Updated for the PD, version 01/13/23: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/2023-2024-tpp-portfolios-and-modeling-assumptions/busbarmethodologyfortppv20230109.pdf

B. Busbar Mapping Dashboard workbook – Base Case Portfolio, 2033

Available at the CPUC's "Portfolios and Modeling Assumptions for the 2023-2024 Transmission Planning Process" webpage: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

C. Busbar Mapping Dashboard workbook – Base Case Portfolio, 2035

Available at the CPUC's "Portfolios and Modeling Assumptions for the 2023-2024 Transmission Planning Process" webpage: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

D. 2022 Baseline Reconciliation and In-Development Resources

Available at the CPUC's "Portfolios and Modeling Assumptions for the 2023-2024 Transmission Planning Process" webpage: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

E. Retirement List of Thermal Generation Units

Available at the CPUC's "Portfolios and Modeling Assumptions for the 2023-2024 Transmission Planning Process" webpage: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

F. CAISO Interconnection Queue Analysis Units

Available at the CPUC's "Portfolios and Modeling Assumptions for the 2023-2024 Transmission Planning Process" webpage: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

G. October 2022 Ruling Busbar Mapping Dashboard workbook – Base Case Portfolio, 2033

Released with 10/07/2022 Ruling: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/2023-2024-tpp-portfolios-and-modeling-assumptions/2033_busbardashboard_30mmt_base_public_v100722.xlsx

H. October 2022 Ruling Busbar Mapping Dashboard workbook – Base Case Portfolio, 2035

Released with 10/07/2022 Ruling: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/integrated-resource-plan-and-long-term-procurement-plan-irp-ltpp/2022-irp-cycle-events-and-materials/2023-2024-tpp-portfolios-and-modeling-assumptions/2035_busbardashboard_30mmt_base_public_v100722.xlsx

---- DOCUMENT ENDS ----

ATTACHMENT “2”

PUBLIC UTILITIES COMMISSION
505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298

FILED
01/13/23
02:08 PM
R2005003

January 13, 2023

Agenda ID #21286
Ratesetting

TO PARTIES OF RECORD IN RULEMAKING 20-05-003:

This is the proposed decision of Administrative Law Judge Julie A. Fitch. Until and unless the Commission hears the item and votes to approve it, the proposed decision has no legal effect. This item may be heard, at the earliest, at the Commission's February 23, 2023 Business Meeting. To confirm when the item will be heard, please see the Business Meeting agenda, which is posted on the Commission's website 10 days before each Business Meeting.

Parties of record may file comments on the proposed decision as provided in Rule 14.3 of the Commission's Rules of Practice and Procedure.

The Commission may hold a Ratesetting Deliberative Meeting to consider this item in closed session in advance of the Business Meeting at which the item will be heard. In such event, notice of the Ratesetting Deliberative Meeting will appear in the Daily Calendar, which is posted on the Commission's website. If a Ratesetting Deliberative Meeting is scheduled, *ex parte* communications are prohibited pursuant to Rule 8.2(c)(4).

/s/ MICHELLE COOKE
Michelle Cooke
Acting Chief Administrative Law Judge

MLC:jnf
Attachment

Decision **PROPOSED DECISION OF ALJ FITCH (Mailed 1/13/2023)**

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes.	Rulemaking 20-05-003

DECISION ORDERING SUPPLEMENTAL MID-TERM RELIABILITY PROCUREMENT (2026-2027) AND TRANSMITTING ELECTRIC RESOURCE PORTFOLIOS TO CALIFORNIA INDEPENDENT SYSTEM OPERATOR FOR 2023-2024 TRANSMISSION PLANNING PROCESS

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Appendix A – Modeling Assumptions for the 2023-2024 Transmission Planning Process

DECISION ORDERING SUPPLEMENTAL MID-TERM RELIABILITY PROCUREMENT (2026-2027) AND TRANSMITTING ELECTRIC RESOURCE PORTFOLIOS TO CALIFORNIA INDEPENDENT SYSTEM OPERATOR FOR 2023-2024 TRANSMISSION PLANNING PROCESS

Summary

This decision addresses two primary topics. First, the decision requires supplemental mid-term reliability procurement of a total of 4,000 megawatts (MW) of net qualifying capacity (NQC) in addition to the 11,500 MW ordered previously in Decision (D.) 21-06-035. This additional procurement for 2026 and 2027 is required for several reasons: 1) updated load forecasting from the California Energy Commission (CEC) that suggests that electricity demand is increasing and will continue to increase compared to when D.21-06-035 was adopted; 2) the increasing and accelerating impacts of climate change; 3) the likelihood of some additional fossil-fueled generation resource retirements that were not anticipated at the time D.21-06-035 was issued; and 4) the likelihood that some delays beyond 2026 in the procurement of long lead-time resources required by D.21-06-035 will be necessary. In addition to the additional 4,000 MW NQC of procurement ordered in this decision, requirements for procurement of long lead-time resources from D.21-06-035 are automatically postponed to 2028, but the existing February 1, 2023 procurement data filing requirements remain unchanged.

Second, this decision recommends electricity resource portfolios to the California Independent System Operator to study in its 2023-2024 Transmission Planning Process. The decision includes recommendations that are broadly consistent with the staff recommendations included in the October 7, 2022 Administrative Law Judge ruling issued in this proceeding, with

some modifications to respond to parties' comments. The general recommendations are as follows:

- Base case portfolio, for both reliability and policy-driven purposes, to be used to determine transmission investments needed: a portfolio that expects 69 gigawatts (GW) nameplate of new resources by 2033 and 85 GW nameplate of new resources by 2035 to be built to meet a 30 million metric ton greenhouse gas emissions target in 2030, and uses the CEC's 2021 Integrated Energy Policy Report "Additional Transportation Electrification" high load scenario.
- One sensitivity portfolio, for study purposes:
  - A portfolio of 75 GW nameplate of new resources in 2035 that is designed to refine and update transmission capability and upgrade assumptions relevant to offshore wind resources, such that offshore wind is 13.4 GW by 2035 as compared to 4.7 GW in the base case.

This proceeding remains open.

1. Background

1.1. Mid-Term Procurement Issues

On September 8, 2022, an Administrative Law Judge's (ALJ) ruling was issued seeking comments on, among other things, potential near-term actions the Commission could take to encourage additional procurement to meet or exceed the requirements of Decision (D.) 19-11-016 and D.21-06-035. The ruling also sought ideas for the Commission to remove any barriers to additional procurement. Among the options discussed in the ruling were modifications to the way D.19-11-016 and D.21-06-035 treated "baseline" resources. In addition, parties were invited to suggest their own options for steps the Commission could take to encourage procurement.

Comments in response to the September 8, 2022 ALJ ruling were timely filed no later than September 26, 2022, by the following parties: Alliance for Retail Energy Markets (AReM); Bioenergy Association of California (BAC); California Independent System Operator (CAISO); California Community Choice Association (CalCCA); Central Coast Community Energy (C3E); City and County of San Francisco (CCSF); Clean Energy Alliance (CEA); Clean Power Alliance of Southern California (CPA); Diamond Generating LLC (Diamond); East Bay Community Energy (EBCE); Environmental Defense Fund (EDF); Fervo Energy (Fervo); Hydrostor, Inc. (Hydrostor); L. Jan Reid (Reid); LS Power Development (LS Power); Pacific Gas and Electric Company (PG&E); Peninsula Clean Energy (PCE); Public Advocates Office of the California Public Utilities Commission (Cal Advocates); San Diego Community Power (SDCP); San Diego Gas & Electric Company (SDG&E); San Jose Clean Energy (SJCE) and Marin Clean Energy (MCE), jointly; Shell Energy North America (Shell); Sierra Club and California Environmental Justice Alliance (CEJA), jointly; Silicon Valley Clean Energy (SVCE); Sonoma Clean Power Authority (SCPA) and Redwood Coast Energy Authority (RCEA), jointly; Southern California Edison Company (SCE); and Vistra Corp. (Vistra).

Timely reply comments were filed in response to the September 8, 2022 ALJ ruling by no later than October 6, 2022, by the following parties: ACP-CA; AReM; CAISO; Cal Advocates; CalCCA; CEJA and Sierra Club, jointly; California Energy Storage Alliance (CESA); Enchanted Rock, LLC (Enchanted Rock); EDF; Fervo; Hydrostor; PG&E; SCE; SDCP; SDG&E; and Shell.

1.2. CAISO TPP Portfolios

Under longstanding agreement among the California Public Utilities Commission (Commission), the California Energy Commission (CEC), and the

California Independent System Operator (CAISO), and according to the terms of the CAISO tariff, every year the Commission recommends to the CAISO base case electricity resource portfolios to be used as key inputs to the CAISO transmission planning process (TPP). Typically, there is both a base case portfolio for reliability and another that is policy driven; the two portfolios have often been identical. In addition, the Commission usually requests that the CAISO study one or more sensitivity cases designed to help inform future planning and analysis.

On October 7, 2022, an ALJ ruling was issued seeking comments from parties on Commission staff recommendations for portfolios to be used in the upcoming 2023-2024 TPP. The ALJ ruling included a recommended framework for TPP portfolio selection, descriptions of the proposed portfolios, and a methodology for resource-to-busbar mapping and assumptions.

The following parties timely filed comments on or before October 31, 2022, in response to the October 7, 2022 ALJ ruling: American Clean Power - California (ACP-CA); Avangrid Renewables, Inc. (Avangrid); Bay Area Municipal Transmission Group (BAMx); Cal Advocates; CalCCA; CESA; CEJA and Sierra Club, jointly; CAISO; California Wind Energy Association (CalWEA); Center for Energy Efficiency and Renewable Technologies (CEERT); Coalition for the Optimization of Renewable Development (CORD); Defenders of Wildlife (DOW); EDF Renewables, Inc. (EDF Renewables); EDF; Geothermal Rising; Golden State Clean Energy, LLC (Golden State); Green Power Institute (GPI); GridLiance West LLC (GridLiance); Reid; Large-Scale Solar Association (LSA); LS Power; Natural Resources Defense Council (NRDC); Offshore Wind California (OWC); PG&E; RCEA; SDG&E; Solar Energy Industries Association (SEIA); and SCE.

The following parties timely filed reply comments on or before November 10, 2022, in response to the October 7, 2022 ALJ ruling: ACP-CA; BAMx; California Efficiency + Demand Management Council (CEDMC); California Unions for Reliable Energy (CURE) and Coalition of California Utility Employees (CCUE), jointly; CAISO; CalCCA; CEERT; CESA; EDF; Geothermal Rising; Golden State; GPI; GridLiance; LSA; LS Power; NRDC; PG&E; RCEA; SCE; SEIA; and Vistra.

2. Mid-Term Procurement Issues

The September 8, 2022 ALJ ruling described a number of circumstances that have changed since the two prior procurement orders in the integrated resources planning (IRP) context have been issued (D.19-11-016 and D.21-06-035). Those changes include, but are not limited to, the following factors that contributed to recent higher CEC demand forecasts, as well as the need for more procurement:

- Increasing frequency of extreme weather conditions, including heat leading to increased electricity demand and drought leading to decreased availability of hydroelectric generating capacity;
- Increasing electricity demand overall, beyond levels forecasted by the CEC in previous annual demand forecasts. This is likely due to a combination of factors including weather, increasing penetration of electric vehicles, increasing penetration of air conditioning, electrification of buildings, and changing consumption patterns during and after the COVID-19 pandemic;
- Decreasing availability of imported electricity, due to the above factors impacting other states in the West, especially the Northwest, on which California traditionally relies for seasonal imports;
- Less electric capacity availability in the market, due to aging and retirement of some older generating units; and

- Accelerating goals for clean energy production and reductions in greenhouse gas (GHG) emissions through 2045 and earlier.

In addition, there have been several recent changes to the regulatory and statutory landscape that impact procurement activities, including the following:

- Changing the resource adequacy obligations of the load serving entities (LSEs) (*see* D.22-06-050);
- The introduction of a state strategic reliability reserve (*see* Assembly Bill (AB) 205 (Stats. 2022, Ch. 61));
- Allowing for an extension of the timeline for the retirement of the Diablo Canyon Power Plant (*see* Senate Bill (SB) 846 (Dodd, 2022));
- Creating legally binding goals for carbon neutrality (AB 1279 (Muratsuchi, 2022) and SB 1020 (Laird, 2020)); and
- Requiring the transmittal of resource portfolios that extend 15 years into the future instead of the earlier practice of 10 years (SB 887 (Becker, 2022)).

While policy and regulatory developments are ongoing with respect to some of these items, the clear collective trend points towards increasing demand for clean electricity and increasing need for additional resources.

The September 8, 2022 ALJ ruling focused on any additional changes the Commission could make in the near-term to encourage LSEs to continue with successful procurement of electricity resources in a difficult market environment, prior to our next formal need assessment that will take place over the next several months and prior to the adoption of a preferred system plan (PSP) and implementation of a programmatic approach also discussed in the September 8, 2022 ALJ ruling.

The September 8, 2022 ALJ ruling also discussed that, in addition to all of the above factors, LSEs and developers are facing exogenous factors such as supply chain impacts on availability of raw materials, import investigations with respect to solar panels, tightening of the economy in the face of inflation, increased demand for clean energy resources throughout the west and globally, and other factors that have material impacts on the development of projects.[1]

In light of all of the above trends and factors that put generally-increasing emphasis on the need for procurement of resources and development of new clean energy resources, the Commission has continued to encourage LSEs to procure as much as possible to meet both current and future electricity resource needs.

In addition, the PSP adopted in D.22-02-004 shows the need for approximately 35,000 MW nameplate of new resources on the electric system by 2030 in order to meet both reliability and GHG goals. Even if all of the incremental resources ordered to date were to come to fruition, that procurement will only meet roughly half of the additional resources needed by the end of the decade to meet the expected portfolio being adopted later in this decision to be used for transmission planning. Thus, the September 8, 2022 ALJ ruling discussed that it is imperative that LSEs continue to procure, both to meet these needs in the next decade, in advance of any additional procurement requirements from the Commission, as well as due to the potential for some projects currently in development not to reach commercial operation on the required procurement timelines.

The September 8, 2022 ALJ ruling noted that, in the event of an LSE's failure to meet one or more of the required procurement targets, the Commission will carefully evaluate whether an LSE continued to procure to help meet system

[1] Also note the work of the Tracking Energy Development Task Force, with more information available at the following link: www.cpuc.ca.gov/trackingenergy

reliability and GHG needs, even if the procurement is slightly delayed or otherwise does not meet the letter of the decisions' requirements.

The September 8, 2022 ALJ ruling also noted that, in general, indications are that projects expected to meet the requirements of D.19-11-016 for the years 2021 and 2022 have been contracted for and are coming online, and although some have been delayed in terms of contracted online dates, collectively LSEs appear to have brought online new resources that meet the D.19-11-016 requirements for 2021 and 2022. It also appears that most projects required for 2023 in D.19-11-016 are also contracted, but it remains to be seen whether the projects will come online on time (by June 1, 2023) to meet Summer 2023 needs. In addition, progress towards D.21-06-035 requirements for 2023 and 2024, which are large, appears to be lagging. The next opportunity for a formal check of status of D.19-11-016 procurement will be with the February 1, 2023 progress filings due from LSEs as provided for in D.20-12-044, when the Commission will receive the data to determine whether any backstop procurement may be needed for any LSEs that have failed to meet their obligations. This will also be the first opportunity for a formal compliance check related to D.21-06-035 procurement. This decision may have an impact on some elements of these filings subsequent to the February 1, 2023. In the meantime, for the February 1, 2023 filing requirements, LSEs should continue to follow current direction in decisions already adopted, filing requirements from Commission staff, and other provided instructions such as the Frequently Asked Questions (FAQ) provided by Commission staff.[2]

[2] Available at the following link: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/more-information-on-authorizing-procurement/irp-procurement-track

2.1. Baseline Resources

In response to the September 8, 2022 ALJ ruling, LSEs were asked to identify resources that were included in the baseline for D.19-11-016 and/or D.21-06-035, but which have not come online. "Baseline" resources are projects that the Commission assumed would be online when determining the capacity needs required by D.19-11-016 and D.21-06-035.

2.1.1. Responses from Parties

Six LSEs (PG&E, MCE, SCPA, SCE, SDG&E, and SVCE) and one developer (Vistra) identified projects that were in the baselines and still pending or that were in the baselines but unlikely to come to fruition.

For the D.19-11-016 baseline projects that were originally expected but currently unlikely to come online based on current project status, a total of 24 renewable projects and two storage projects were identified, totaling 222 MW and 19 MW nameplate, respectively. LSEs stated that all of the renewable and storage projects have been terminated and none is expected to come online.

For the D.21-06-035 baseline projects that were originally expected to come online but now unlikely to come to fruition, ten projects were identified. Four are renewable projects totaling 240 MW nameplate. Six are battery storage projects totaling 152 MW nameplate, one of which is the Oakland Energy Storage project (36 MW) that is terminated and not expected to come online. There is also one fossil-fueled project that is 55 MW that was retired in 2021.

There are seven additional projects that were included in the baseline for D.19-11-016 and D.21-06-035, one renewable that is 13.5 MW in nameplate, and six battery storage projects that total 180 MW nameplate, that have not come online.

2.1.2. Discussion

Based on the above information submitted by LSEs and Vistra, in total the approximate nameplate capacity of the baseline projects that have not materialized but may still be able to come online is roughly 570 MW.

2.2. Potential Baseline Resource Adjustments

The September 8, 2022 ruling sought input from parties where some clarification from the Commission may result in the removal of a barrier to procurement and development of additional resources. In D.19-11-016, the baseline that was set included a number of prospective resources that had not yet come online as of the date of the order, but where offtake contracts had been signed. The intent was to order procurement that is in addition to those resources that were already in the pipeline.

As discussed in Section 2.1 above, the potential for some previously expected baseline resources to still be developed is a maximum of roughly 570 MW nameplate. In most, if not all, cases, the reliability of the electric system would benefit from having these resources online, but because of the way the baseline was set for D.19-11-016, they do not "count" toward the D.19-11-016 additional capacity requirements. Likewise, because the baseline for the additional procurement required in D.21-06-035 was built upon the D.19-11-016 baseline, the resources also currently would not count toward D.21-06-035 requirements, by the terms of the Commission's previous orders.

These resources are important for reliability and were already being counted on for planning purposes when the Commission considered the additional procurement requirements. At the same time, if the Commission were to allow them to count toward D.19-11-016 or D.21-06-035 procurement requirements, the reliability benefits of the incremental resources required in those orders would be diluted by the same amount.

To remedy this situation, the September 8, 2022 ruling proposed the following solution: the "baseline" for both D.19-11-016 and D.21-06-035 procurement would be reframed to allow any resource that has come online since January 1, 2020, to count toward the LSE's procurement obligations.

In general, incremental resources coming online after January 1, 2020, would be counted first toward the D.19-11-016 obligations, with any excess applied to D.21-06-035, assuming the particular resource meets the general capacity requirements or the specific attributes required for the specific procurement categories in the D.21-06-035 obligations.

In addition, an amount of net qualifying capacity (NQC) commensurate with the capacity of baseline resources that have not yet come online would be added to the obligations of all LSEs collectively in 2025, to account for the dilution effect of allowing resources in the original baseline to count toward D.19-11-016 or D.21-06-035 obligations.

Alternatively, the September 8, 2022 ALJ ruling stated that LSEs with baseline resources not yet online could identify the resource to the Commission and have that amount of capacity added to their own individual obligation in 2025.

Either way, this proposal would act to maintain the same level of reliability expected by the Commission when D.21-06-035 was issued,[3] while increasing the flexibility of LSEs to bring new resources online and continue procuring toward their obligations.

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[3] The need determination analysis that led to D.21-06-035 did include an allowance for some project failure.

Finally, the September 8, 2022 ALJ ruling suggested that, should the Commission adopt this proposal, new resources would be considered incremental if their actual online date was later than the January 1, 2020 online date cutoff suggested. Thus, there would no longer be a "baseline" list maintained by Commission staff for testing whether procurement "counts" toward a particular obligation. The eligibility of a new resource toward compliance with procurement orders would be based on online date, along with any other criteria required by the future decision, with no relation to existing baselines.

2.2.1. Comments of Parties

CAISO questions the feasibility of eliminating the baseline because the Commission will need to track planned resources that are delayed or fail to come online. CAISO recommends 1) providing a list of prospective resources assumed in IRP procurement authorizations and 2) tracking each resource's progress. This list, according to the CAISO, should reference the IRP procurement order and be used to authorize future procurement commensurate with the delayed resources' effective capacity. Lastly, the CAISO urges the Commission to authorize immediately additional procurement to replace the effective capacity of retiring units.

CAISO is also concerned with a capacity shortfall that may occur using an arbitrary baseline cutoff date. CAISO recommends that the Commission require LSEs to procure additional resources to replace delayed baseline resources commensurate with the delayed resource's original NQC, to overcome decreasing effective load carrying capability (ELCC) values. CAISO states that the effective capacity is more accurate because ELCC values generally decrease over time. Thus, according to the CAISO, increasing LSE obligations in 2025 does not address the pressing capacity need until that date, and the Commission should order replacement capacity as soon as possible to address the reliability gap. Finally, CAISO highlights changes to the demand forecast and stresses the recent heatwave experiences, combined with uncertainty around retiring resources and the impact of extreme heat on generating unit outages, as reasons to order replacement capacity for delayed baseline resources.

EDF supports the proposed baseline modification, with a modification to allow baseline resources that have come online between January 1, 2020 and now to count towards LSEs' procurement obligations without adding an amount of NQC equivalent to the capacity of these resources to future LSE procurement obligations. EDF notes that the Commission should modify the proposal to ensure that the amount of NQC equivalent to the capacity of all baseline resources not online as of January 1, 2020 should be added to the LSE's 2025 procurement obligations to ensure no reduction in system reliability.

GPI supports adding baseline resource capacity not yet online to LSEs' 2025 obligations, but would do it based on load share. GPI also notes that the Commission would need to clarify if the additional 2025 NQC would need to meet a specific procurement category as defined by D.21-06-035 or if it would be limited by D.19-11-016 requirements. GPI also recommends that the Commission make clear that fossil-fueled resources should not be allowed to count for any reallocated NQC requirements.

Further, GPI notes that the baseline NQC approach in both procurement orders may have deterred procurement, with LSEs potentially incentivized to hold off on any additional procurement above and beyond the orders to ensure that any additional procurement could count towards likely new and additional orders. As such, GPI recommends clarifying the baseline for future orders will be set to before January 1, 2020. GPI also notes the programmatic approach being created, but still recommends clarifying to remove any uncertainty or gaps. Finally, GPI notes that re-allocating NQC to 2025 could also account for retiring resources, which could be added to the 2025 procurement date.

Cal Advocates supports allowing resources that are not currently online to count towards the procurement order and adding them to LSEs' procurement obligations in 2025. Cal Advocates recommends that the Commission 1) adjust the NQC value of remaining baseline capacity in 2020, and 2) include a methodology for allocating procurement responsibility among LSEs for remaining capacity in 2025. Cal Advocates contends that the Commission should account for changes in NQC to determine the final capacity need in 2025. Finally, Cal Advocates opposes getting rid of the baseline list of resources, stating that it is important so that other parties can validate their modeling.

SCE supports allowing any eligible resource that came online after January 1, 2020 to count toward LSE procurement obligations. SCE concurs with statements in the ruling calling out specific factors making procurement more difficult, and also highlights delays in the CAISO cluster process as further hampering resource development. SCE notes that the proposed baseline changes provide flexibility to balance these challenges without jeopardizing reliability. SCE also supports adding the capacity to the 2025 obligations, and suggests the Commission clarify the NQC requirements for D.19-11-016 or D.21-06-035 obligations to ensure the LSE is fulfilling the need of both decisions.

SCE also raises that LSEs using resources that were originally part of the baseline should be responsible for procuring an equivalent amount of NQC to ensure fair procurement. SCE recommends that LSEs submit filings demonstrating which resources they are counting towards procurement requirements to allow the Commission to determine what additional NQC is needed in 2025. SCE further contends that the baseline modification should apply to resources procured under the cost allocation mechanism (CAM), with those resources retaining their CAM cost recovery but allowing the investor owned utilities (IOUs) to file Tier 2 Advice Letters to change which procurement obligation the CAM resources are being counted towards. SCE also asks for clarification on ELCC values to be used for NQC valuation.

EBCE supports modifications that allow resources online after January 1, 2020, to be considered incremental because this provides LSEs greater certainty when procuring resources. EBCE states that a single date is easier for LSEs to use and for the Commission to evaluate. EBCE also supports having additional capacity added back to an LSE's procurement obligation, noting that having LSEs responsible for their share of reliability and greenhouse gas (GHG) reducing procurement provides greater certainty to LSEs and protects those that have already met their own procurement obligations.

PG&E suggests that the Commission should consider supplementing the current procurement orders to ensure that procurement targets are met. PG&E encourages the Commission to keep other procurement targets within their respective proceedings, noting that Renewable Market Adjusting Tariff (ReMAT) resources included in the baseline that are delayed should remain within the ReMAT program and not IRP to prevent double-procurement and additional ratepayer costs. For resources not accounted for in other proceedings, PG&E supports assigning procurement responsibility to the LSE that was supposed to bring the resource online. PG&E also recommends that replacement resources be required by June 1, 2026, and not 2025, to give LSEs enough time to issue and complete solicitations. Finally, PG&E also recommends not allowing for opt-outs, consistent with D.21-06-035.

SDG&E requests additional clarification about how capacity would be allocated among LSEs and how the additional capacity would be considered for future procurement obligations before supporting the baseline adjustment proposal.

2.2.2. Discussion

After consideration of parties' input, we will adopt a "swap" process that allows an LSE to nominate a project on the D.19-11-016 and/or D.21-06-035 baseline generator list to be considered for removal. An equal amount of procurement obligation (in NQC) will then be added to the LSE's 2025 procurement obligation under the provisions of D.21-06-035.

An LSE seeking a baseline swap will need to file a Tier 2 Advice Letter with its request. Commission staff will maintain and post to our web site two current baselines list for both D.19-11-016 and D.21-06-035 resources, as well as each LSE's procurement obligations, as adjusted to account for any approved baseline swaps authorized. A swap will allow an LSE that held or holds a resources that is on the baseline to count towards an IRP obligation provided it adds capacity to its procurement obligation at a later date. Since the baseline development process did not yield a baseline list that definitively identified the LSE that originally contracted for the resource, this swap process will be necessary to be handled informally by Commission staff.

Additionally, if a new LSE wants to contract for and count a baseline resource towards its IRP procurement obligation, when that LSE had previously not held a contract with the project and the original purchasing LSE has terminated the contract, the new LSE may also make a baseline waiver request to

Commission staff. In such cases, which are expected to be rare, the resources may be removed from the baseline entirely and counted toward a later obligation of the new LSE, resulting in a slight dilution of the original baseline. Staff will track and evaluate these situations on a case-by-case basis.

We will not allow CAM resources to participate in this swap or waiver process. Given that the costs and benefits for CAM resources are shared among all LSE customers in an IOU's service territory, it could be unfair and difficult to allow an IOU to remove a CAM resource from the baseline and apply it solely to its own future procurement obligation.

If a project is removed from the baseline list, it can be allowed to count toward either procurement obligation (D.19-11-016 or D.21-06-035) and its NQC will be based on the decision for which it is being counted for compliance. In other words, if an LSE seeks to remove a project from the D.19-11-016 baseline list and instead wants to count it toward a D.21-06-035 obligation, the resource will be counted towards the D.21-06-035 obligation using D.21-06-035 ELCC values, according to whichever tranche the project is coming online to meet. If it is being used to meet the D.19-11-016 obligations, then it will be counted using the D.19-11-016 vintage of ELCC values. Then, the LSE's 2025 procurement obligation will be increased by the same amount, with updated NQC amounts based on ELCC values for 2025.

We recognize that, in general, it is likely that the project's NQC will be lower if it is removed from the baseline and added to the 2025 D.21-06-035 obligation of an LSE. This is still preferable to not having the resource developed at all (which may occur if we do not provide a pathway for counting the resource), because we want to see as much capacity developed as possible.

We also note that D.19-11-016 obligations are smaller and not subject to the penalties that are attached to D.21-06-035 obligations. We will empower Commission staff to scrutinize any requested baseline swaps that appear to be gaming attempts to avoid penalties. Commission staff will have the discretion to review any swap request against the LSE's progress toward their total procurement obligations for each of the two procurement decisions. If staff suspect that the LSE is gaming the swap to avoid penalties, staff will not make the swap but will instead refer the request to the ALJ to evaluate further through inclusion in the formal record of the IRP proceeding, for ultimate disposition.

In response to PG&E's concern about ReMAT or other non-IRP procurement requirements, we agree that we want to avoid the risk of double-counting capacity if the resource is addressed in another proceeding (such as ReMAT, which is addressed in the RPS proceeding) but removed from the baseline in this proceeding. In general, and to clarify, eligibility of those resources that are required in other proceedings will not be disturbed in this proceeding, even if the resource is removed from the IRP procurement baseline for either D.19-11-016 and/or D.21-06-035.

By addressing the baseline resource issues with the swap opportunity for individual LSEs, we are allowing resources that come online after January 1, 2020 to count towards IRP compliance, while the LSE that seeks the swap increases its individual 2025 IRP obligations. As noted above, these swap arrangements will be posted on the IRP website for transparency and will require Commission staff to maintain procurement baseline generator lists.

Regarding the CAISO's concern about the need for a baseline for modeling purposes, we clarify that the September 8, 2022 ALJ ruling was not intended to question the use of baselines for modeling. We recognize that a baseline set of resources is a fundamental input to modeling, particularly capacity expansion modeling. The current assumptions are available on our website.[4]

2.3. Additional Procurement Requirements

The September 8, 2022 ALJ ruling invited parties to suggest other changes that the Commission might make or actions we might take to encourage additional procurement by LSEs to meet or exceed the requirements of D.19-11-016 and D.21-06-035. One party, Cal Advocates, put forward a proposal in their opening comments to have the Commission order additional procurement of a total of 4,000 MW NQC between 2026 and 2030.

Cal Advocates proposes five annual increments of 500 MW to account for the forecasted CAISO system 1-in-2 peak load growth (coincident peak load is forecasted in the 2021 Integrated Energy Policy Report (IEPR) to increase by 500 MW each year, starting in 2027). In addition, Cal Advocates proposes one increment of 1,000 MW NQC to account for additional climate change impacts that may not be reflected in the forecast. There would also be a final 500 MW NQC increment to allow for additional resource retirements that may occur in advance of assumed retirement dates. As part of its proposal, Cal Advocates suggests accelerating procurement one year ahead of the predicted need. The resulting additional procurement Cal Advocates proposes to be required by the Commission is summarized in Table 1 below.

[4] See the following link: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/unified-ra-and-irp-modeling-datasets-2022

Table 1: Cal Advocates' Additional Procurement Requirement Recommendations (in Annual MW NQC, except final column)

Need Type	2026	2027	2028	2029	2030	Cumulative
Load Increase	500	500	500	500	500	2,500
Climate Change	1,000	0	0	0	0	1,000
Retirements	0	500	0	0	0	500
Total	**1,500**	**1,000**	**500**	**500**	**500**	**4,000**

Cal Advocates also recommends adopting all rules and mechanisms associated with D.21-06-035 for expediency. Cal Advocates argues that the critical benefit of ordering some minimum procurement immediately is to afford the LSEs greater lead time, and therefore greater project development feasibility.

2.3.1. Comments of Parties

CAISO supports the Cal Advocates proposal and suggests the procurement be authorized well ahead of need, to reduce bottlenecks. CAISO also suggests that LSEs make every effort to procure in locations where few, if any, transmission upgrades are needed or where transmission is already under development.

Hydrostor also supports the proposal and suggests a minimum of 605 MW of long duration energy storage be procured.

EDF supports the proposal, as long as the order will not divert Commission resources away from the development of the Reliable and Clean Power Procurement Program. EDF is concerned about the Commission becoming stuck in a cycle of ad hoc, interim procurement orders.

Enchanted Rock supports the Cal Advocates proposal and suggests the Commission expand the orders to include renewable natural gas as an eligible resource.

AReM opposes the Cal Advocates proposal. AReM states that, at a minimum, additional procurement should only be ordered after a transparent stakeholder process and should be supported by rigorous analysis. AReM believes that further rushed procurement in current market conditions risks increasing costs without defined benefits.

PG&E also opposes, on the grounds that the Commission should not issue an additional order that is not need-based and is not driven by cost causation principles. PG&E also states that pursuing the Cal Advocates proposal would continue the out-of-cycle procurement processes already used in IRP and run counter to the Commission's aim to move towards a more programmatic approach to procurement.

CEJA and Sierra Club also oppose the proposal and suggest that the Commission take a few months to conduct a need determination and order new procurement based on that analysis, focusing on zero emission resources and demand-side programs. CEJA and Sierra Club further suggest that the Commission should act to take advantage of federal funding and strengthen demand-side programs authorized in the emergency reliability decisions in the past few years.

2.3.2. Discussion

The September 8, 2022 ALJ ruling included a list of factors that have contributed to the likely need for more procurement of electricity resources in California, including the following:

- Increasing frequency of extreme weather conditions, including heat leading to increased electricity demand and drought leading to decreased availability of hydroelectric generating capacity;

- Increasing electricity demand overall, beyond levels forecasted by the CEC in previous annual demand forecasts. This is likely due to a combination of factors including weather, increasing penetration of electric vehicles, increasing penetration of air conditioning, electrification of buildings, and changing consumption patterns during and after the COVID-19 pandemic;
- Decreasing availability of imported electricity, due to the above factors impacting other states in the West, especially the Northwest, on which California traditionally relies for seasonal imports;
- Less electric capacity availability in the market, due to aging and retirement of some older generating units; and
- Accelerating goals for clean energy production and reductions in GHG emissions through 2045 and earlier.

In addition, the September 8, 2022 ALJ ruling cited several recent changes to the regulatory and statutory landscape that impact procurement activities, including the following:

- Changing the resource adequacy obligations of the LSEs (*see* D.22-06-050);
- The introduction of a state strategic reliability reserve (*see* Assembly Bill (AB) 205 (Stats. 2022, Ch. 61));
- Allowing for an extension of the timeline for the retirement of the Diablo Canyon Power Plant yet maintaining the need for the Commission not to consider the energy or capacity of Diablo Canyon as available for resource planning purposes (*see* Senate Bill (SB) 846 (Dodd, 2022)); and
- Creating legally binding goals for carbon neutrality (AB 1279 (Muratsuchi, 2022) and SB 1020 (Laird, 2020)).

All of the factors putting pressure on system reliability remain in effect. As much as we would like to agree with EDF that we should focus on development of a programmatic approach to procurement, we also are convinced that we cannot wait for that larger process to be complete before ordering additional procurement. In 2022, the electric system came very close to running out of resources, and it actually did run out in 2020. The system is much closer to a supply and demand balance than is comfortable for reliability purposes. While the Commission-jurisdictional LSEs did collectively procure sufficient resources to exceed our resource adequacy obligations in 2022, the tight market conditions led to high capacity prices and some LSEs were deficient in some months of the year. These situations, coupled with the lengthy lead time needed for the development of new resources, persuade us that we need to order new procurement now so that the LSEs can have sufficient time to contract for and develop the resources.

In contemplating requiring additional procurement, we are in complete agreement with Cal Advocates that the procurement should be an addition to the resources ordered in D.21-06-035 and utilize the same eligibility and compliance rules as that decision. Thus, we will require the additional procurement we order here to be an addition to the capacity ordered in D.21-06-035, and it shall be subject to the same baseline, compliance rules, penalties, monitoring and enforcement process, and need allocation. These items are discussed in more detail below.

Even as we issued D.21-06-035, we were aware that additional procurement may be needed, especially in the latter two years of the period addressed (which covered 2023-2026). In particular, there was uncertainty, even in early 2021, about the feasibility of developing the 2,000 MW long-lead-time (LLT) resources required in 2026. In addition, the resource procurement requirements in D.21-06-035 were front-loaded due to the large capacity of resources anticipated to go offline with the retirement of both units of Diablo Canyon. The need determination for 2025 and 2026 was therefore less certain than the need determination for 2023 and 2024. Further, we agree with Cal Advocates' suggestion that procurement should be ordered at least a year ahead of when it is shown to be needed, to allow for some buffer in the event that procurement takes longer than anticipated, as a safety precaution.

Taking all of these factors into consideration, as well as the proposal from Cal Advocates, we will order the additional 4,000 MW NQC proposed by Cal Advocates be added to the mid-term reliability procurement requirements from D.21-06-035, but in a slightly different manner from the proposal, as follows.

We are mindful that the 6,000 MW of procurement requirements for 2024 is a heavy lift for the LSEs. Procurement of those requirements should be well underway and LSEs might be unlikely to achieve any additional procurement in 2024 even if we ordered it. The requirement in 2025 is an additional 1,500 MW, for a total of 7,500 MW over the 2024-2025 period, which is still a large amount of procurement in a short period.

The D.21-06-035 requirement in 2026, however, was for a different sort of procurement, for LLT resources. LLT resources are defined as long-duration storage (able to deliver at maximum capacity for at least eight hours from a single resource) and generation capacity that has no on-site emissions or is eligible under the requirements of the renewables portfolio standard program with a capacity factor of at least 80 percent. The latter category of resources must not be use limited or weather dependent, and cannot be storage projects.[5]

[5] *See* D.21-06-035, OP 2, for the formal definition of these requirements.

As already noted, even in 2021 we were uncertain whether those resources could be developed in time for a 2026 need, and therefore we included provisions in D.21-06-035 for extensions of those requirements up to 2028.

By way of this order, we will amend the LLT requirement slightly and allow any LSE to show compliance with its LLT requirements at any time between 2026 and 2028. Effectively, this moves the requirement for 2,000 MW of LLT resources to 2028, instead of 2026. If the LLT resources come online in a year prior to 2028, then the individual LSE would still have a generic capacity procurement obligation in 2028. LSEs should still provide evidence of the good faith efforts required in D.21-06-035, Ordering Paragraph (OP) 5, by the February 1, 2023 milestone filing, but the Commission will hold off ordering any backstop of this type of resources as a result of that filing.

For LSEs that have already procured some or all of their required LLT resources, they may substitute those resources for the 2026 or 2027 resources required in this order, and move the additional procurement required herein to 2028. In other words, in total, there will be 2,000 MW of LLT resources procured between 2026 and 2028, such that the total resource procurement in each year adds to 2,000 MW NQC.

This change obviates the need for any extension requests by LSEs that anticipate not making the original 2026 online date deadline in D.21-06-035 and will remove a lot of necessary regulatory process for LSE, the Commission, and staff around the LLT requirements and anticipated extension requests.

In place of the 2026 requirements for LLT resources, we will instead require procurement of 2,000 MW of September NQC resources by June 1, 2026. These resources may be of any sort that would otherwise qualify under the generic category in D.21-06-035, which means non-emitting, storage, and/or RPS eligible, but not fossil-fueled resources. In addition, we will add an additional 2,000 MW of September NQC procurement requirement by June 1, 2027 of the same type of generic clean resources. Thus, the expanded mid-term reliability requirements will be as given in Table 2 below.

Table 2: Increased Mid-Term Reliability Procurement Requirements (in MW, September NQC)

Need Type	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
General D.21-06-035 requirements[6]	2,000	6,000	1,500			
LLT resources, as defined in D.21-06-035						2,000
New in this decision				2,000	2,000	
Total	**2,000**	**6,000**	**1,500**	**2,000**	**2,000**	**2,000**
Total (cumulative)	**2,000**	**8,000**	**9,500**	**11,500**	**13,500**	**15,500**

Counting of qualifying capacity will be based on ELCC studies published by Commission staff for the year in which the procurement is required. Commission staff may provide new compliance ELCCs for resources to meet the procurement being required here, if necessary, by no later than the end of 2023, and will notify stakeholders via a notice to the service list of this proceeding. For resource types not addressed by additional guidance from Commission staff, NQC counting will be in accordance with the new system resource adequacy NQC counting rules at the time the contract for the new resource or capacity added to an existing resource is executed.

The procurement required in Table 2 above results in a relatively steady procurement requirement for the years 2025-2028, and will allow the

[6] This includes the procurement category requiring zero-emissions generation, generation paired with storage, or demand response resources, and does not include the category specifically designed for replacement of Diablo Canyon capacity.

Commission to continue to evaluate, in consultation with the CAISO and CEC, the system reliability picture between now and the end of the required procurement period. The procurement requirements adopted herein in NQC terms are still less than the totals the PSP portfolio totals show in nameplate,[7] strongly suggesting that future procurement will continue to be required for many years to come.

We decline to extend the additional requirements to 2030, as suggested by Cal Advocates, because we intend to develop the programmatic procurement approach in time to influence procurement ordered after this decision. Should that plan not come to fruition, we will need to reevaluate how to order additional procurement in the future.

In the meantime, the procurement requirements will be allocated among all LSEs using the same method used by D.21-06-035. This means utilizing a combination of both the 2021 year-ahead resource adequacy forecasts and the energy load forecasts of individual LSEs from the 2020 IEPR for 2021. Load migration since the D.21-06-035 order are already accounted for through the power charge indifference amount (PCIA) mechanism.

LSEs will be responsible for conducting their own procurement for the additional need allocated to them, and LSEs will not have the option to opt out to have another LSE procure on their behalf. Responsibility for the new procurement only will be allocated to LSEs currently in the market and the allocation of the D.21-06-035 procurement requirements will not be readjusted. This means that the 4,000 MW total requirements for 2026 and 2027 will be

[7] *See* D.22-02-004.

allocated to current LSEs based on the 2021 IEPR demand forecast, and the LLT resource allocation will remain as it was in D.21-06-035.

The backstop provisions of D.20-12-044 will remain in effect, along with the annual milestones, which will be extended throughout the period through the end of 2028. This means bi-annual procurement data filings from each LSE on February 1 and August 1, continuing in perpetuity unless we change this schedule in a subsequent decision. This will include backstop trigger determinations after the February filings, as described in more detail in D.20-12-044 and D.21-06-035.

Cost allocation, in the event that we order backstop procurement, will follow the modified cost allocation mechanism (MCAM) requirements adopted in D.22-05-015.

Penalties for non-compliance for the increased/expanded mid-term reliability procurement requirements in this decision will follow the previously-established requirements in D.21-06-035, based on the cost of new entry (CONE). However, D.21-06-035 set only one penalty milestone date of June 1, 2025, for all procurement during the period 2023-2025. Because this decision begins to set ongoing and annual procurement requirements, after June 1, 2025, we will assess compliance on an annual basis, with the potential for penalties to be assessed on each LSE for failure to meet any of the annual procurement requirements.

In addition, we note that we continue to require procurement for our IRP jurisdictional LSEs, without regard to procurement need that may be attributable to load being served by publicly-owned utilities within the CAISO. This matter was discussed in D.22-02-004 and still requires additional consideration for the future procurement program development and any subsequent procurement orders.

Finally, with respect to concerns raised by GPI, among other parties, we encourage LSEs to continue procuring resources in advance of any additional orders or our adoption of a comprehensive procurement program framework. Using whatever mechanism we adopt, we expect to give credit for and take into account proactive and early procurement by LSEs.

2.4. Other Modifications to Prior Decisions to Facilitate Continued Procurement

Beyond ordering additional procurement amounts, the September 8, 2022 ALJ ruling invited parties to suggest other changes that the Commission might make or actions we might take to encourage additional procurement by LSEs to meet or exceed the requirements of D.19-11-016 and D.21-06-035.

Twenty one parties submitted proposed modifications to prior decisions or expressed a perception that future action is needed. Proposals included changes to penalty provisions, changes to D.21-06-035 procurement categories, changes to compliance rules, changes to bridge resource requirements, interconnection issues, proposals for new or modified procurement orders, consideration of the role of fossil-fueled resources, as well as other topics.

For time and space reasons, we are not including every suggested action in the discussion in this decision. We have eliminated some proposals from consideration because they are either out of scope, would require major changes to existing procurement requirements (and therefore would need additional record development), or are otherwise not immediately implementable in this decision. We have also eliminated any suggestions that were considered and rejected in prior decisions and where the circumstances have not changed to justify reconsideration.

2.4.1. Penalty Calculation and Enforcement for D.21-06-035 Procurement

In response to the September 8, 2022 ALJ ruling, several parties brought up desired clarifications to the penalty provisions of D.21-06-035.

2.4.1.1. Proposal of Parties

AReM, SCE, CalCCA, and EBCE all brought up the idea that the Commission should not enforce penalties against LSEs that make good faith procurement efforts but are still unable to procure, based on exogenous factors discussed in the September 8, 2022 ALJ ruling. Parties also suggested that the Commission should consider the potential of penalty "layering" since there are multiple regulatory programs and potential penalties in IRP, resource adequacy, and the RPS program.

In reply comments, this proposal was supported by SENA and AReM (supporting SCE and EBCE comments). CalCCA supports a modified version of SCE's penalty waiver proposal through a twelve-month compliance extension framework, based on an LSE's good faith showing. Hydrostor supports these proposals and suggests that the Commission clarify that if procurement is slightly delayed, including an online date after the mandated deadline, that good faith efforts will be taken into consideration. CAISO states that LSEs should not be penalized for delays due to network upgrades. SENA suggests the Commission should consider providing LSEs some form of relief, whether through grace periods, penalty waivers, or extended compliance deadlines, given the significant global supply chain uncertainty and overall difficult procurement circumstances.

AReM and CalCCA also asked for clarification of how the net cost of new entry (CONE) would be calculated, if the avoided costs calculator (ACC) moves away from including that provision in the future, as has been suggested in the integrated distributed energy resource (IDER) rulemaking where the ACC is updated. AReM and CalCCA also suggest that the Commission should clarify that a penalty imposed in 2025 will only be applied to the 2023-2025 procurement shortfall and not future years. Finally, they seek clarity on whether backstop procurement (and associated costs) will be for a ten-year period, or only until the LSE can bring its resource online.

2.4.1.2. Discussion

On the face of it, it is difficult to see how clarifying or loosening the penalty structure will help get additional resources procured and built faster, which was the purpose of the invitation to parties to provide ideas. Furthermore, indicating any laxity in the penalty structure up front may directly harm any ratepayers of LSEs that have endeavored to procure capacity, sometimes under difficult or costly terms. Therefore, we will not relieve any LSE of potential penalties up front. However, we recognize that there are exogenous factors happening in the market in general, including, but likely not limited to, the ones listed in the September 8, 2022 ALJ ruling. We also recognize that LSEs may make all good faith efforts to procure the required resources and simply be unable to for reasons beyond their control.

Nonetheless, the Commission expects LSEs to make those good faith efforts to procure the required resources to meet their allocated procurement requirements. Commission and staff will consider deficiencies and non-compliance on a case-by-case basis, taking the LSE's efforts and all relevant and exogenous factors into account.

On the question of calculation of net CONE, if the IDER proceeding does not publish an updated net CONE figure for the year a penalty would be imposed (*i.e.*, 2025 or later), we will find another way to maintain the calculation of these values to be used for IRP penalty purposes.

We do clarify that AReM and CalCCA are correct that penalty amounts assessed in 2025 will be based on the capacity obligations for 2023-2025, and not future years. In other words, the penalties will not be ongoing, but are for those specific years' worth of capacity obligations. However, once backstop procurement is ordered, the cost and quantity of the backstop procurement amount is the responsibility of the deficient LSE for a full ten-year period, and the particular LSE (and its customers) will be responsible for the costs of the backstop procurement for the entire ten-year period, even if the LSE's contracted resources are brought online in the meantime. If an LSE fails to meet a procurement obligation, it will pay an annual penalty for each year it is deficient, for up to ten years, and will additionally pay for the full cost of a ten-year contract for backstop for additional resources.

We also clarify that the questions of whether backstop procurement should be ordered and whether penalties should be assessed are separate, but related. It is possible that we could order backstop procurement, but not order penalties for a non-complying LSE, where best efforts simply did not produce the required capacity. It is equally possible that we could order penalties, but not backstop procurement, for example in a situation where the LSE's resource(s) will be online within a short period of time.

Finally, we note that because we are moving the deadline for the procurement of LLT resources from 2026 (as was ordered in D.21-06-035) to 2028 in this order, the question of whether penalties will be levied for LSEs that seek an extension past 2026 for LLT resources is now moot. Penalties may be assessed for failure to procure LLT resources when penalties are considered for 2028.

2.4.2. Procurement Categories from D.21-06-035

In response to the September 8, 2022 ALJ ruling, several parties brought up desired changes or clarifications to the categories of procurement required by D.21-06-035. In most cases, these ideas represented suggestions that were already considered and dismissed when D.21-06-035 was adopted. However, below we discuss one potential clarification with respect to the category of resources designed to replace Diablo Canyon Power Plant capacity.

2.4.2.1. Proposal of Parties

SVCE and SCPA/RCEA propose that we provide additional flexibility to LSEs to meet the zero-emitting Diablo Canyon replacement category in D.21-06-035. SVCE/SCPA/RCEA propose that LSEs should be allowed to procure energy and batteries separately, so long as the energy is deliverable to the system. They argue that LSEs should be allowed to count hybrid resources for which an LSE may not contract for the energy directly, but where the energy is otherwise not used for compliance with D.21-06-035 and has economic incentives to charge the battery and dispatch during peak hours.

In reply comments, AReM and CalCCA support the proposal and SCE believes that procuring storage and renewables separately is already permissible. SCE requests that the Commission clarify that energy-only renewable generation contracts can be contractually paired with separate energy storage contracts.

2.4.2.2. Discussion

On these issues, we clarify that SCE is correct that energy and storage contracts can be procured separately and still comply with the Diablo Canyon replacement category of resources. However, both the energy and storage must be contracted by the LSE that is claiming them for compliance with the requirements of D.21-06-035.

Further, we clarify that contracts for energy-only renewables may be used to comply with the Diablo replacement category requirement, but only if they can demonstrate by engineering assessment that the energy delivered will be sufficient to charge the batteries to discharge to meet the resource requirements originally set forth in D.21-06-035 and subsequent FAQ documents from Commission staff.[8] This would not enable the energy-only resources to count directly as capacity/NQC towards an LSE's obligation, but will support the counting of the NQC of the storage resource.

2.4.3. Bridge Resources for D.21-06-035 Procurement

In response to the September 8, 2022 ALJ ruling, several parties raised issues around the use of imports to serve as a bridge to bringing online new resources. The basic concept is to allow for additional development time for new resources to come online without compromising short-term reliability, by contracting on a short-term basis with existing resources to be firm and committed to serving load in California.

2.4.3.1. Proposal of Parties

AReM proposes to allow capacity and efficiency upgrades at existing natural gas facilities to count as bridge capacity.

SCE recommends that the Commission allow bridge capacity from any firm imports to California, including firm imports from fossil-fueled resources, resources that do not meet other D.21-06-035 eligibility requirements, and resources from other counterparties. SCE also recommends restricting firm

[8] Refer to this link under the heading "Additional Procurement Guidance" for more details: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/more-information-on-authorizing-procurement/irp-procurement-track.

imports as a bridge for only one year and not allowing the resources to count toward the LSE's resource adequacy requirements.

AReM supports allowing firm imports to count, but believes that this is already allowed. CEJA and Sierra Club oppose allowing bridge resources that create climate or air pollution impacts and support limiting bridge resources to one year. CAISO supports SCE's proposal, with no firm position on other eligibility requirements proposed by SCE. Enchanted Rock supports SCE's proposal and states that "ten year term for bridge capacity procured by 2025 should not result in any negative impacts for the Commission's goal to achieve a specified resource mix by 2035." PG&E and SENA also support SCE's proposal.

2.4.3.2. Discussion

We confirm AReM's interpretation that D.21-06-035 does allow firm imports to count toward capacity requirements and serve as bridge resources until new capacity comes online. Prior to now, those resources were required to be renewable and/or zero-emitting to qualify.

D.21-06-035 contains extensive discussion about the use of natural gas efficiency and capacity upgrades to existing natural gas plants in California to count toward its requirements, and concludes that these resources do not qualify to be counted. We do not disturb that determination here as it was thoroughly debated during the deliberations prior to D.21-06-035.

We do, however, allow for bridge resource purposes, the limited situation where an LSE wants to use a firm import contract for system power, which may include a mix of natural gas-fueled and/or unspecified resources, to count. We will allow this type of bridge, because it is not likely to be a long-term arrangement and is not likely to result in any increase or incremental capacity that is fossil-fueled to be built. Rather, it serves only as a temporary reliability hedge until such time as the LSE's clean resources come online.

We also will allow resources from other counterparties than the developer of the primary resource to serve as bridge resources, as suggested by SCE.

We decline to limit the term to one year, as proposed by SCE, because it seems unnecessarily limiting and we cannot know up front exactly the length of time that is needed to bridge to the new resources coming online. In any case, the term may not be longer than ten years, but may be more than one year. The ten-year maximum should ensure that this provision is not used to support development of new resources, but rather to utilize existing resources for reliability purposes.

Finally, the requirements in D.21-06-035 for imports to have a MIC allocation to be counted for compliance purposes, still apply for the bridge resource situation described here.

2.4.4. Compliance Rules for D.19-11-016 and D.21-06-035

In response to the September 8, 2022 ALJ ruling, several parties put forward proposals to clarify specific compliance rules for D.21-06-035 requirements.

2.4.4.1. Proposal of Parties

SENA proposes that the Commission confirm that LSEs may split capacity associated with a single resource that has come online since January 1, 2020, between its D.19-11-016 and D.21-06-035 procurement requirements.

SCPA and RCEA propose that the Commission clarify that LSEs may trade compliance obligations. For example, LSE A has a new resource coming online in 2025 for its own compliance obligation and may only need a two-year bridge to its online date. LSE B may have procured resources in excess of its allocated share for 2023 and 2024. Rather than requiring backstop procurement for LSE A who is short for 2023 and 2024, SCPA and RCEA propose that LSE A can transact for 2023-2024 share of its procurement obligation from LSE B.

CalCCA supports this proposal.

SCE states that the Commission did not address what cost recovery mechanism applies when an IOU takes on the procurement obligation of a failed LSE in D.21-06-035. SCE proposes that CAM treatment should apply when an LSE with an IRP procurement obligation declares bankruptcy or ceases providing retail service in California and the IOU is required to procure on behalf of the failed LSE's customers, even if the LSE's customers are not paying for capacity under the MCAM.

SDCP proposes that, due to significant changes impacting procurement since D.19-11-016 and D.21-06-035 were issued, the Commission should modify the provision in D.22-05-015, OP 4, to allow non-IOU LSEs the option to purchase their customers' share of D.19-11-016 resources from the incumbent IOU based on the most current version of load forecasts in the 2023 year-ahead load forecast process.

SCE opposes this SDCP proposal, as D.22-05-015 already allowed for a one-time provision at the market price benchmark.

2.4.4.2. Discussion

In response to SENA's suggestion, we clarify that an LSE may split the capacity associated with a single resource between its D.19-11-016 and D.21-06-035 obligations, as long as the resource meets the requirements of the decision for which it is being counted, including being incremental to the respective decision's baseline generator list of resources.

In response to SCPA and RCEA, we agree that trading of compliance obligations between LSEs is reasonable and permissible. However, we need a way to verify and track such arrangements. We already have a similar process in place where IOUs and non-IOUs can track changing obligations for load migration through the filing of a Tier 2 Advice Letter. For purposes of a trade of obligations between any two LSEs, we will require the same mechanism. Each of the LSEs involved in the trade transaction shall file a Tier 2 Advice Letter providing documentation of the trade arrangement.

On the question of the cost recovery mechanism to be used when an IOU takes on the D.21-06-035 compliance obligation of a bankrupt LSE or one that ceases providing retail service in California, we agree with SCE. CAM cost recovery shall apply when an IOU takes on the D.21-06-035 obligation of an LSE that is in bankruptcy or is otherwise no longer providing retail service if the LSE's customers are not already paying for the same capacity under the MCAM. This is the most fair mechanism, because the IOU's bundled customers should not be obligated to take on the full responsibility for the costs on behalf of customers previously served by another LSE.

Finally, with respect to the SDCP proposal to allow non-IOU LSEs the option to purchase its customers' share of D.19-11-016 resources from the incumbent IOU, we decline to authorize this here and note that it is the subject of a separate petition for modification of D.22-05-015, which we will address separately. Meanwhile, D.22-05-015 already allowed for a one-time provision of capacity from the incumbent IOU. After that one-time opportunity, the MCAM (D.22-05-015) makes clear that any subsequent load migration will be subject to the power charge indifference adjustment (PCIA) mechanism. SDCP does not have a D.19-11-016 compliance obligation, so to the extent that the purpose of the proposal involves the need for resource adequacy capacity, there is already a framework approved by the Commission for sales of excess capacity by the IOUs.

2.4.5. Interconnection Issues

In response to the September 8, 2022 ALJ ruling, several parties raised ideas related to generator interconnection.

2.4.5.1. Proposal of Parties

CalCCA and PCE propose that the Commission allow projects without a CAISO deliverability study to count temporarily toward D.21-06-035 requirements under certain conditions. CalCCA and PCE are concerned that there is a significant backlog for the CAISO interconnection study process. They state that the Commission should work with the CAISO to improve the interconnection study process, urge transmission owners to shorten interconnection times, and reevaluate the deliverability methodology as the current method is too restrictive.

CAISO disagrees that the deliverability methodology is too restrictive. CAISO points out that deliverability assessment supports reliability and LSEs should ensure procured in-state resources obtain deliverability and that there is sufficient maximum import capability (MIC) allocation for their imports. CAISO suggests, however, that LSEs should not be penalized for delays in project deliverability due to network upgrades.

CCSF, Fervo, PCE, SVCE, SCPA, and RCEA all suggest that the MIC process also presents an obstacle to compliance with D.21-06-035 requirements. They suggest that the Commission modify the MIC allocation requirements and consider crediting LSEs for imports either pseudo-tied or dynamically-scheduled into the CAISO that have achieved commercial operation, even if they do not yet have a MIC allocation, as long as the LSE is seeking to secure a MIC allocation. AReM supports this proposal.

Fervo further proposes that the Commission adopt policies to prioritize import capacity allocation for resources with capacity factors greater than 80 percent.

2.4.5.2. Discussion

First, it is important that parties understand that the MIC allocation process is not within the Commission's control, but is administered by the CAISO. Thus, we may offer recommendations, but the Commission does not make MIC decisions. Therefore, while we may be sympathetic with certain proposals, such as Fervo's for high capacity factor resources, we understand that the CAISO follows its established process for MIC allocations.

We also agree with the CAISO that the interconnection study process is important to ensure reliability, and therefore the deliverability studies should not be subjected to shortcuts.

We do clarify, however, that pseudo-tied and dynamically-scheduled projects are allowed to count toward D.21-06-035 requirements even if they do not yet have a MIC allocation, as long as the LSE is taking steps to obtain the MIC allocation. Since it is difficult or often impossible to secure a MIC allocation prior to the resource coming online, it is logical that the IRP procurement requirement should allow a resource to count towards a procurement obligation starting in the year it is actually providing power, even if the MIC allocation is not yet confirmed.

3. CAISO TPP Recommendations

In this section, we turn to the recommended portfolios we transmit to the CAISO for use in its 2023-24 TPP. The October 7, 2022 ALJ ruling in this proceeding contained the staff recommendations for portfolios. In this decision, we take into account the comments of parties in response to the staff recommendations.

3.1. Base Case Portfolio

As most parties are aware, the Commission annually recommends a base case portfolio for study in the TPP. There can be both a reliability base case and a policy-driven base case. In recent years, the Commission has recommended the same portfolio as the base case for both reliability and policy. Once the CAISO studies the base case, transmission needs identified go to the CAISO board for approval.

3.1.1. GHG and Load Assumptions

For the 2023-2024 TPP base case, Commission staff in the October 7, 2022 ALJ ruling recommended using a portfolio that meets a 30 million metric ton (MMT) GHG target in 2030, with load assumptions based on the CEC's IEPR Additional Transportation Electrification (TE) Load Scenario. This is a portfolio with more resources required to serve more load than was adopted as the PSP to be used by LSEs to plan for their most recent individual IRPs filed on November 1, 2022. The portfolio includes approximately 86 GW of new resources by 2035, on top of the existing resource mix on the electric grid of approximately 75 GW. This is more than a doubling of nameplate capacity on the system within 12 years.

Table 3. Total Base Case Portfolio Resource Additions (in MW)

Resource	**2026**	**2030**	**2033**	**2035**
Natural Gas	-	-	-	128
Biomass	107	134	134	134
Geothermal	1,095	1,151	1,863	1,863
Hydro (small)	-	-	-	-
Wind	3,864	3,864	3,864	3,864
Wind (out of state, on new transmission)	312	4,828	4,828	4,828
Offshore Wind	120	3,100	3,261	4,707
Solar	11,073	21,367	32,025	39,072
Customer Solar	-	-	-	-
Battery Storage	11,145	13,529	21,738	28,381
Pumped Storage	196	1,000	1,524	2,000
Shed Demand Response	1,111	1,111	1,111	1,111
Total	**29,025**	**50,085**	**70,349**	**86,089**

The modeled portfolio also reveals that greenhouse gas emissions become the binding constraint on the portfolio starting in 2025, and the planning reserve margin also drives new resource development needs after 2028. Note also that Commission staff chose to replace the 128 MW of new gas selected in 2035 with 174 MW of geothermal in the preliminary busbar mapping analysis, since it is state policy not to plan for development of new natural gas resources if they can be avoided.[9]

The general rationale for recommending this portfolio, among other things, is that transmission planning and construction typically has a longer lead time than generation and storage. Recent work, including the SB 100 (DeLeon,

[9] *See*, among other things, the letter from Governor Newsom to CARB, available at the following link: https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf?emrc=1054d6 .

2018) report and the 20-year transmission outlook by the CAISO, demonstrates the need for significantly more generation and storage to meet California's climate policy goals, beyond what is included in this portfolio. Therefore, if California is to meets its aggressive reliability and environmental goals, more transmission will need to be planned and built ahead of generation and storage development, and it is just a matter of exactly when, and not if, the transmission will be needed.

3.1.1.1. Comments of Parties

The clear majority of parties in this proceeding support the staff recommendation to use a 30 MMT GHG base case, with the higher electrification load assumptions. Those parties supporting include: ACP-CA, Avangrid Renewables, CAISO, CalCCA, Cal Advocates, CalWEA, CEERT, CESA, CEJA, Sierra Club, Western Grid, DOW, Golden State, GridLiance, Geothermal Rising, GPI, EDF, EDF Renewables, NRDC, SDG&E, and SEIA.

BAMx and Reid support using the 38 MMT portfolio in 2030. BAMx is concerned that the larger portfolio in the staff recommendation could lead to excessive or sub-optimal transmission upgrades. Reid is concerned that the 30 MMT portfolio will unnecessarily increase ratepayer costs.

SCE supports the staff base case proposal, but feels that the load forecast is likely too low. SCE is concerned that the proposed base case portfolio incorporating the 2021 IEPR Additional TE scenario does not reflect the recent accelerated Electric Vehicle (EV) adoption trend in the near term.

PG&E supports the proposed base case, but generally thinks it should be more aggressive than IRP planning to allow for transmission development. PG&E recommends future iterations of the IEPR Additional TE load forecast align with the California Air Resources Board (CARB) Scoping Plan scenarios or, to the extent they are not aligned, the CEC should articulate how and why the IEPR Additional TE scenario is not aligned with CARB's Scoping Plan scenarios.

3.1.1.2. Discussion

For the 2023-2024 TPP, we will adopt the staff recommendation to use the 30 MMT GHG scenario in 2030, with load based on the CEC's 2021 IEPR Additional TE scenario. We generally agree with PG&E and SCE that the load forecasts should continue to be refined, in accordance with the CARB Scoping Plan. We will continue to work with the CEC and CARB to ensure that our planning efforts remain aligned. Given that the TPP is an annual process, the current portfolio (30 MMT in 2030, with the additional TE load forecast) will be aggressive enough, with 85 GW nameplate of new resources, and a significant advancement from previous base case scenarios. In fact, the 30 MMT scenario in 2030 is the most aggressive level within the range set by CARB in its 2022 Scoping Plan Update, which sets a range of 30-38 MMT by 2030 for the electric sector.[10] Next year, as we do every year, we will consider whether the load forecast and other assumptions need to be updated further.

We disagree with Reid and BAMx in their recommendations to revert to a 38 MMT in 2030 base case. If we are to reach our aggressive goals, transmission infrastructure needs to be planned and built at a faster rate. The 30 MMT in 2030 base case will help accelerate the necessary transmission development.

3.1.2. Planning Horizon

Commission staff, in the October 7, 2022 ALJ ruling, recommended a 12-year planning horizon, out to 2035, instead of the usual ten years. The

[10] *See* https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2022/res22-21.pdf.

purpose is to align with both the CEC's IEPR process and the CAISO's TPP, both of which are now planning out to 2035.

3.1.2.1. Comments of Parties

Several parties explicitly support mapping out to 2035, as suggested by Commission staff, including CalCCA, CalWEA, CESA, EDF, GridLiance, Geothermal Rising, and Golden State.

ACP-CA, Avangrid Renewables, CESA, NRDC, and EDF also recommend extending the time horizon to 15 years or more, in line with future requirements of SB 887 (Becker, 2022).

3.1.2.2. Discussion

For this TPP cycle, we will keep the 2035 planning year, in keeping with the Commission staff recommendation. CAISO is still in the process of conducting its stakeholder process to formally extend its study timelines consistent with SB 887 requirements. In general, current planning tools and processes between the Commission, CEC, and CAISO require additional work before transmission investments should be made on their basis beyond the 12-year horizon adopted here. The 2035 planning year is in current alignment with the CEC and CAISO processes, and we will continue to stay coordinated as all of our planning processes evolve.

We do request, in accordance with SB 887 (Becker, 2022), that the CAISO do the following: 1) identify, based as much as possible on CAISO studies and Commission and CEC projections completed before January 1, 2023, the highest priority transmission facilities that are needed to allow for increased transmission capacity into local capacity areas to deliver renewable energy resources and/or zero-carbon resources that are expected to be developed by

2035 into those areas; and 2) consider whether to approve transmission projects as part of its 2022-2023 TPP.

3.1.3. Offshore Wind Amount, Location, and Timing

The October 7, 2022 ALJ ruling recommended including 4.7 gigawatts (GW) of offshore wind in the base case portfolio. Offshore wind was selected by the RESOLVE capacity expansion model at Morro Bay (3.1 GW) in 2033, and at the Humboldt location (1.6 GW) in 2035. The busbar mapping results linked in the ALJ ruling identified that mapping the amount selected at the Humboldt location to busbars would cause significant exceedance of the available transmission that could only be alleviated with significant new transmission development.

3.1.3.1. Comments of Parties

The majority of parties support at least the level of offshore wind in the portfolio, as well as the timing. Several parties recommend increasing the amount of offshore wind in the base case, to reflect either the increased energy density assumptions shown in the updated 2022 National Renewable Energy Laboratory (NREL) study of offshore wind potential[11] or alignment with AB 525 (Chiu, 2021) planning goals, or both.

CalWEA is focused on aligning with the 2022 NREL resource potential amounts. ACP-CA and EDF focused on aligning with AB 525 goal amounts; OWC-CA stresses the importance of both. OWC, EDF, and NRDC also comment on the long development times and potential for delays, arguing that those require starting as early as possible to develop the transmission. RCEA and

[11] Available at: https://www.nrel.gov/wind/offshore-market-assessment.html.

SCPA also strongly support more optimal study of the transmission needs on the north coast, as do CalWEA and ACP-CA.

PG&E and SCE note that development/permitting timeline uncertainty and cost uncertainty are large variables for offshore wind, particularly in the north coast/Humboldt area. Both suggest that additional study is needed, but do not recommend changes to the base case amounts or timing.

BAMX expresses concerns for the transmission cost assumptions in the Humboldt area, and recommends rerunning the model with higher transmission costs to see if the Humboldt offshore wind would still be selected.

CalCCA, RCEA, and SCPA express concern about the rapid buildout of Humboldt offshore wind between 2033 and 2035, suggesting instead a slower ramp up that starts earlier than 2035.

3.1.3.2. Discussion

For purposes of the base case, we will maintain the 4.7 GW of offshore wind, divided between the Morro Bay and Humboldt call areas, as recommended by Commission staff in the October 7, 2022 ALJ ruling. We will also continue to monitor and participate in the AB 525 effort to ensure that offshore wind amounts in future base cases consider the planning goals in the AB 525 strategic plan that is due to be released later this year.

We also choose to maintain the locations where the 4.7 GW of offshore wind is mapped, in both the central and north coasts, despite the high likelihood of the CAISO finding that this will require significant new transmission to be built to access generation in the Humboldt area. We expect that it is a matter of when, not if, north coast offshore wind is part of the resource mix needed to meet state GHG-reduction goals. Further, the recent results of the lease auctions for offshore wind resources show interest in the Humboldt area and support our assessment that we need transmission development in the area to commence soon. In addition, the Humboldt resource area will likely require longer development timelines compared to transmission development on the central coast, thus making it important to study, and with its inclusion in the base case portfolio, potentially be approved for development, sooner rather than later. CAISO's 2023-2024 TPP need findings could be further considered in conjunction with the AB 525 strategic plan to determine the urgency of the transmission development.

With respect to the comments about optimizing transmission buildout for offshore wind, our hope is that the offshore wind sensitivity portfolio described in Section 3.2 below will further assist for transmission planning purposes. The CAISO will be able to use the results of that sensitivity analysis to guide optimal transmission development on the north coast, both for the 2023-2024 base case and for future portfolios.

With respect to the rapid buildout of north coast wind between 2033 and 2035, we agree with CalCCA, RCEA, and SCPA that this may be unrealistic. However, the purpose here is to identify the transmission needs, and therefore the exact timing is likely less important than the volume, for TPP purposes. The reality will likely be similar to the more gradual buildout that the parties describe.

3.1.4. Addition of Geothermal Resources

In this section, we discuss a few parties' proposals to add additional diverse resources to the base case.

3.1.4.1. Comments of Parties

Several parties note that the base case portfolio is heavy on solar and battery storage buildout. For diversity purposes, therefore, some parties recommend the addition of more geothermal to balance the portfolio.

GPI argues for the inclusion of more baseload renewable resources, favoring high-reliability and resource diversity. GridLiance and Geothermal Rising also argue for additional geothermal, as well as updating cost assumptions for geothermal resources. GridLiance specifically argues for more geothermal located in Southern Nevada, while RCEA and SCPA would prefer to add geothermal in Northern California.

3.1.4.2. Discussion

At this time, we are not convinced that adding additional geothermal to the portfolio is warranted, given that it would likely go beyond identified commercial interest in its development. However, Commission staff has already replaced some of the selected fossil-fueled resources with geothermal and this may require new transmission investments. We are strongly in support of the development of additional geothermal, and will continue to assess the transmission needs to access it in the future.

3.1.5. Deliverability Study Expectations

This section discusses the request that the Commission made to the CAISO by letter dated July 1, 2022, when transmitting the high electrification portfolio for study in the 2022-2023 TPP. Specifically, President Alice Reynolds, Commissioner Rechtschaffen and Commissioner Gunda of the CEC requested that the CAISO study transmission resources needed to support LLT resources, as well as to expand MIC beyond the CAISO balancing area authority.

3.1.5.1. Comments of Parties

CAISO requests that the Commission clarify its guidance in this regard. CalCCA requests that the Commission use the same guidance as in the July 1, 2022 letter to the CAISO in the transmittal of the portfolios for the 2023-2024 TPP.

CESA recommends that the Commission modify its guidance to include long-duration energy storage as part of the study needed to support LLT resources.

3.1.5.2. Discussion

We generally request that the CAISO utilize the same methodology as discussed in the July 1, 2022 letter from Commissioners Alice Reynolds, Rechtschaffen, and Gunda. Specifically, we ask that CAISO continue the necessary studies to inform and enable opportunities to provide MIC expansion and the development of incremental transmission capacity to support the LLT resources mapped in the policy- and reliability-driven base case portfolio, while preserving the existing transmission capacity that has been allocated to other projects earlier in the interconnection queue.

To aid in addressing this request, as discussed in the October 7, 2022 ALJ ruling, Commission staff proposed prioritizing busbar mapping alignment to resources in the CAISO's interconnection queue that have been assigned transmission plan deliverability (TPD). In seeking to balance the various busbar mapping criteria, the resulting mapped portfolios will not fully account for assigned TPD in the key regions for mapped LLT resources, particularly for the 2033 study year. To that end, Commission staff will identify assigned TPD unaccounted for by the mapping result in the key regions for the CAISO to include in its TPP studies, in addition to the mapped portfolio results.

We also agree with CESA that if any of the long-duration energy storage resources are located out of the CAISO balancing area, then those resources should still be included within LLT resources. We generally consider long-duration energy storage to be a subset of LLT resources.

3.1.6. Portfolio Reliability

In this section, we discuss parties' requests/recommendations for reliability studies on the base case and sensitivity portfolios recommended by Commission staff.

3.1.6.1. Comments of Parties

SDG&E and Cal Advocates both recommend that the base case and sensitivity portfolios be subjected to production cost modeling to determine the loss of load expectation (LOLE) of each portfolio, in order to assess their reliability. In reply comments, PG&E, CalCCA, ACP-CA, GPI, CEERT, and CAISO all supported this request.

3.1.6.2. Discussion

A full loss of load expectation (LOLE) study has been done by Commission staff on the base case portfolio, including both the baseline resources as well as the new resources selected by the RESOLVE model. Commission staff translated RESOLVE portfolios in each study year into generation resources in the SERVM model, and the resulting portfolios were tested against the 2021 IEPR demand forecast in each of the four study years (2026, 2030, 2033, and 2035). LOLE results show that the portfolio is determined to be reliable, due to the total LOLE result being below the Commission's 0.1 LOLE standard, indicating less than one loss-of-load event in ten years, in each of the four study years. Table 4 gives the results of the SERVM modeling on the base case portfolio.

Table 4. Base Case LOLE by Study Year (events/year)

Factor	2026	2030	2033	2035
LOLE	0.001	0.000	0.002	0.022
Loss of Load Hours (LOLH)	0.001	0.000	0.005	0.059
LOLH/LOLE (hours per event)	1.000	0.000	2.500	2.682
Expected Unserved Energy	2.641	0.000	18.032	371.330
Annual Demand (GWh)	250,666	261,745	272,906	276,261

Since the base case scenario is being assessed for its transmission needs and will likely result in incremental transmission development and associated costs based on its findings, we agree it is important for the portfolio to be determined to be sufficiently reliable.

We note that the 2026 result is extremely reliable and parties may wonder why, earlier in this decision, we are ordering additional procurement for that year. It is important to understand that the TPP base case portfolio includes resources that are selected by the RESOLVE model as theoretical resources, but that are not yet online or contracted to be online. The base case portfolio is a modeled portfolio, whereas we have based the need for additional procurement on the actual procurement data submitted to us by LSEs, indicating contracted and online resources.

In addition, we note that the SERVM weather year dataset only includes historical weather information up to 2020 and does not yet contain 2022 extreme weather data or further explicit climate impact adjustments. The impacts of extreme weather events and climate change on both resource availability and load are still being explored in this proceeding, and the impacts of these factors on modeled system reliability are likely to be significant. For example, the Summer 2020 heat events that results in rotating outages produced a system peak load that was roughly 10 percent above the IEPR forecasted median peak. As such, while this portfolio has been found to be sufficiently reliable for further assessment in the TPP, recent events and the likelihood of similarly extreme weather in the future, combined with the imperative to maintain an aggressive resource buildout trajectory to achieve the state's clean energy and climate goals, justify the approach to procurement taken in this decision.

In the case of the sensitivity cases recommended (*See* further discussion in Section 3.2 below), sensitivities are not designed to be expected scenarios, optimal alternatives, or even realistic, by definition. Instead, they are designed to test specific transmission needs to develop more cost and feasibility information. Thus, it is not clear there would be much value in conducting reliability studies on the sensitivity portfolios. We also have limited staff and consulting resources, and choose not to deploy them on reliability studies of the sensitivity portfolios, only the base case.

3.1.7. Updated Assumptions

In response to the October 7, 2022 ALJ ruling, several parties recommend updating specific resource costs or potential, as well as incorporating impacts of the Inflation Reduction Act (IRA) of 2022.

3.1.7.1. Comments of Parties

EDF Renewables recommends re-running the base case scenario with the impacts of the incentives in the IRA of 2022. Geothermal Rising recommends updating the base case portfolio with new geothermal cost and potential information.

3.1.7.2. Discussion

At this time, we are not inclined to make these changes to the base case portfolio. There are always new and improved assumptions to take advantage of, which is why Commission staff updates the inputs and assumptions to the modeling on a regular basis. We see no specific need to do so again here prior to transmitting the base case, given the timing of when CAISO needs the mapped portfolios to begin the 2023-2024 TPP cycle. However, we will update these assumptions again each year, as usual.

3.2. Sensitivity Cases

The October 7, 2022 ALJ ruling contained two recommended sensitivity portfolios for the CAISO to study in the 2023-2024 TPP. The first sensitivity is a portfolio with a large amount of offshore wind by 2035, including 5.3 GW at Morro Bay, 3 GW in Humboldt, and another 5 GW on the north coast. The second sensitivity is designed to study the transmission requirements of a portfolio with an alternative resource mix, which assumes only limited development of offshore and out-of-state (OOS) wind on new transmission by 2035. The objective of the second sensitivity is to better understand the transmission needs of a portfolio with significantly more solar, storage, and geothermal resources, and to identify transmission upgrades that may be common across many types of portfolios.

3.2.1. Offshore Wind Sensitivity

This section addresses the first sensitivity, related to approximately 13 GW of offshore wind.

3.2.1.1. Comments of Parties

Most parties commenting on the October 7, 2022 ALJ ruling sensitivity proposals supported asking the CAISO to study the offshore wind sensitivity as recommended.

OWC recommended amending the portfolio to contain the full 25 GW of offshore wind included in the AB 525 planning goal. PG&E specifically recommended allowing more OOS wind into the same portfolio.

3.2.1.2. Discussion

For this TPP cycle, we will keep the offshore wind sensitivity as recommended by Commission staff. Adding addition offshore wind at this time would be somewhat difficult, because the resources need to be mapped to specific locations, which are uncertain. We are uncertain how much more transmission information can be provided without more knowledge of detailed wind locations. However, we agree that more offshore wind is likely to be needed in the long run. Thus, we will look to the CAISO's 20-year transmission outlook and/or future TPP cycle sensitivity cases for more refined study of offshore wind, as its development progresses.

3.2.2. Limited Out-of-State and Offshore Wind Sensitivity

This section discusses the second sensitivity included in the October 7, 2022 ALJ ruling, intended to be an extreme (and unrealistic) portfolio designed to test the transmission needs of a larger portfolio of solar, storage, and geothermal resources, instead of additional offshore and OOS wind resources.

3.2.2.1. Comments of Parties

The second sensitivity portfolio recommended by staff was supported in comments by a number of parties, including CalWEA, CalCCA, Cal Advocates, CESA, EDF Renewables, Golden State, GridLiance, LSA, SEIA, SCE, and PG&E.

Several parties recommended changes to improve the sensitivity to better align with its goals. PG&E recommends further limiting offshore wind by delaying it until 2035. SCE and SEIA would eliminate offshore wind completely, to increase the alternative resources selected. SEIA would also limit OOS wind.

Geothermal Rising would increase the amount of geothermal based on its resource potential. GridLiance suggests relaxing transmission constraints to allow further upgrades, enabling the RESOLVE model to select more resources overall. CEJA recommends additional natural gas plant retirements in local areas be included.

CAISO and ACP-CA opposed studying this portfolio. BAMx and GPI also opposed the portfolio, and instead proposed alternatives for study as a second sensitivity.

CAISO objected to this portfolio for several reasons. First, CAISO argues that the portfolio is not significantly different from the base case and fails to meet the objective of studying an alternative resource mix as laid out in the October 7, 2022 ALJ ruling. Second, CAISO is looking at 2035 for the base case, which they characterize as equivalent to studying another portfolio. Thus, they ask the Commission to be judicious in asking for another sensitivity study, since it will require significant resources and time commitments. CAISO also commits to providing new transmission information through a new white paper that will be based on the recent Cluster 14 studies, which CAISO notes will provide transmission information for a larger portfolio of resources than the sensitivity, because the cluster studies are based on significantly more resource development.

3.2.2.2. Discussion

On the basis of the CAISO recommendations, since they are our partner in these TPP studies, we will not request this second sensitivity. We are convinced to drop this sensitivity request mainly because the portfolio is similar to the base case and may not yield significantly new information at this time and because of CAISO's commitment to provide updated transmission information based on results of the recent Cluster 14 studies. Since the scenario was never designed to be realistic, but rather to test the need for transmission buildout under extreme conditions, we will revisit this concept if warranted in the future.

To the extent possible, we request that the CAISO note in the 2023-2024 TPP if policy-driven transmission projects would be least regrets transmission projects that will be needed whether the offshore and OOS wind resources are developed or not. In other words, we seek to identify multi-purpose transmission lines, using the base case portfolio, the offshore wind sensitivity, and any other existing information such as the 20 Year Transmission Outlook.

3.2.3. Other Proposed Sensitivities

As already mentioned, several stakeholders suggested alternative portfolios to be studied as policy-driven sensitivities.

3.2.3.1. Comments of Parties

CEJA and Sierra Club, as well as EDF, suggest a gas retirement scenario. CAISO supports this concept for future cycles, but not for 2023-2024 due to limited resources.

GPI suggests a portfolio with a high amount of geothermal or otherwise firm and diverse resources. CalCCA supports this suggestion for future TPP cycles.

BAMx suggests a scenario taking into account the extension of Diablo Canyon's license.

3.2.3.2. Discussion

We agree that several of these scenarios would be interesting and informative. We continue to explore, in particular, information about potential natural gas plant retirements, and we understand the Diablo Canyon situation is under examination in broader venues. However, we understand from the CAISO that sensitivity analysis is time intensive. Therefore, due to time constraints on our side and at the CAISO, at this time we will not recommend an additional sensitivity portfolio for study in the 2023-2024 TPP. We will continue to explore these recommendations for next year's TPP sensitivity portfolios.

3.3. Busbar Mapping Methodology

The October 7, 2022 ALJ ruling included updates to the methodology that Commission staff uses to map specific project locations to transmission busbars. Historically, the largest emphasis for location selection has been on identified commercial interest in development.

3.3.1. Priority Consideration of Commercial Interest With Other Criteria

As discussed in the October 7, 2022 ALJ ruling, Commission staff proposed prioritizing busbar mapping alignment to resources in the CAISO's interconnection queue that have been assigned transmission plan deliverability (TPD). If TPD is not accounted for, the TPP analysis may not identify transmission needed for new resources, since TPD is generally already allocated. This alignment was a shift from previous busbar mapping efforts, and resulted in staff prioritizing resources in areas not previously mapped. Thus, compared to the 2022-2023 TPP 30 MMT high electrification portfolio, this year's base case portfolio has fewer resources mapped to certain areas, particularly Southern Nevada, Northern California, and the San Diego and Los Angeles metropolitan areas.

3.3.1.1. Comments of Parties

Several parties commented on the priority balance between commercial interest, as demonstrated by TPD, and the need for other criteria.

CalCCA, CEJA, Sierra Club, and SDG&E all commented on the need for mapping resources to local areas for purposes of planning for natural gas plant retirement.

GridLiance recommends alignment with the mapping already done in the 30 MMT 2022-2023 TPP sensitivity portfolio.

SDG&E and several other parties recommend prioritizing geographic diversity. DOW recommends mapping to minimize environmental impact.

3.3.1.2. Discussion

We agree with parties that advocate for a more balanced mapping of resources, taking into account commercial interest particularly with already-allocated TPD, but also improving alignment with other mapping criteria, including locating storage resources in local areas and disadvantaged communities (DACs) near existing thermal generation. Using a more balanced approach to mapping portfolio resources, while still accounting for assigned TPD to identify the incremental transmission capacity needed to support LLT resources will result in the TPP analysis adding resources for unaccounted-for assigned TPD in addition to the identified portfolio. The benefit of this will be better alignment with multiple priorities. This will help us better identify the transmission needs of reducing dependence on natural gas in local areas, while still enabling assessment of transmission needs for LLT and other resources needing MIC allocations. The downside is that this approach could result in identification of more transmission than is currently needed for the resources identified in the 2035 portfolio, particularly if development does not occur as anticipated.

However, this risk is outweighed by the need to identify additional transmission needs sooner, and therefore staff are directed to work to better balance the portfolio among various mapping criteria outlined in the resource-to-busbar mapping methodology in Attachment A to this decision. Commission staff worked with the CEC and CAISO staff in the busbar mapping working group process to align the mapping more optimally with all the criteria and limit the extend to which resources were mapped to align with TPD at the expense of other criteria included in the methodology.

3.3.2. Inclusion of IRA Benefits in Mapping Criteria

In response to the October 7, 2022 ALJ ruling, both CESA and CEJA noted separate benefits in the IRA of 2022 that could change mapping priorities and criteria. Those are discussed in this section.

3.3.2.1. Comments of Parties

CESA notes that the IRA extends incentives to batteries, regardless of their co-location or standalone status. CESA recommends that we reconsider co-location prioritization of storage in the busbar mapping process.

CEJA notes incentives in the IRA for siting in "energy communities," as well in low-income communities or on Tribal land. CEJA recommends these factors be incorporated into the mapping process.

3.3.2.2. Discussion

We appreciate CESA and CEJA pointing out these aspects of the IRA and we intend to take them into consideration in the next TPP cycle. However, at this stage for the 2023-2024 TPP, there is insufficient time for staff to collect the data to assess and properly implement these new elements of the IRA incentives, which are complex. In the next TPP cycle, Commission staff already expect to do a significant overhaul of the land-use criteria to account for new CEC land-use screens that are currently under development. The aspects of the IRA described by CEJA will fit in well with these planned updates.

3.3.3. Minor and Technical Mapping Changes

In response to the October 7, 2022 ALJ ruling, some parties included specific recommended technical changes to the mapping methodology, criteria, or specific mapped resources.

3.3.3.1. Comments of Parties

Numerous technical recommendations included clarifications to specific import interview for Nevada geothermal, input from parties about resources at specific substations, corrections to commercial interest amounts at selected substations, and clarification requests for parts of the methodology.

3.3.3.2. Discussion

We do not address all of the numerous specific suggestions in this decision, but Commission staff have worked with the CEC and CAISO staff in the busbar mapping working group process to evaluate the particular suggestions of the parties and made changes to the resource-to-busbar mapping methodology and to the mapping results themselves that were warranted.

The final busbar mapping results being transmitted to the CAISO for the base case portfolio will be available at the following link:

https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

The busbar mapping results for the sensitivity portfolio have not been fully developed as of this decision, but will be transmitted to the CAISO at a later date, as in past years. Once completed, the final mapping of the sensitivity portfolio will also be made available at the same link above, and parties to the proceeding will be made aware of its posting.

4. Comments on Proposed Decision

The proposed decision of ALJ Fitch in this matter was mailed to the parties in accordance with Pub. Util. Code section 311 and comments were allowed under Rule 14.3 of the Commission's Rules of Practice and Procedure. Comments were filed on ________________ by the following parties: ______________. Reply comments were filed on ____________ by the following parties: ______________.

5. Assignment of Proceeding

Alice Reynolds is the assigned Commissioner and Julie A. Fitch is the assigned ALJ in this proceeding.

Findings of Fact

1. LSEs have identified 24 renewable and two storage projects, totaling 222 MW and 29 MW nameplate respectively, that have not come online but were included in the D.19-11-016 baseline.

2. LSEs have identified four renewable and six battery storage projects, totaling 240 MW and 152 MW nameplate respectively, that have not come online but were included in the D.21-06-035 baseline.

3. LSEs have identified one renewable and six battery storage projects, totaling 13.5 MW and 180 MW nameplate respectively, that have not come online but were included in the baseline for both D.19-11-016 and D.21-06-035.

4. In total, roughly 570 MW nameplate of renewable and battery storage resources were included in either the D.19-11-016 or D.21-06-035 baseline, or both, that have not come online but still may be able to. These resources can still provide reliability benefits to the electric grid.

5. Allowing LSEs to swap out resources that were listed on the D.19-11-016 and/or the D.21-06-035 baseline resource list and count them toward either

decision's procurement obligations, while adding a commensurate procurement obligation to the individual LSE in 2025, will help contribute to electric system reliability.

6. Cal Advocates proposes requiring an additional 4,000 MW of procurement requirements between 2026 and 2030, based on the increased load forecast, increasing impacts of climate change, and the likelihood of retirement of additional natural gas generation units.

7. Since D.21-06-035 was issued, the CEC has increased the demand forecast and California has been facing the accelerating impacts of climate change. Other exogenous factors, such as increasing penetration of electric vehicle, decreasing availability of imports, increasing building electrification, increasing penetration of air conditioning, etc. have also added additional pressure to the reliability of the electric system.

8. 4,000 MW of NQC, divided evenly between 2026 and 2027, will increase the reliability of the electric grid.

9. As already contemplated in D.21-06-035, some LSEs may need until 2028 to procure the LLT resources specified in that decision.

10. D.21-06-035 set penalty levels for failure to provide the required resources based on net CONE. We will maintain that level and clarify that it is for the year in which non-compliance occurs and is not ongoing.

11. Allowing firm imports from bridge resources (existing resources) contracted until a new resource has time to come online will help enhance electric grid reliability.

12. Allocation of MIC is a CAISO function; the Commission may make recommendations but does not control the process.

13. The CAISO requires portfolio recommendations from the Commission to utilize in conducting their annual TPP, as outlined in their tariff.

14. The Commission should evaluate electric resource portfolios utilized for TPP purposes using a twelve-year planning horizon, now including 2035, to align with the CAISO and CEC planning efforts.

15. The electric resource portfolio that meets a 30 MMT GHG emissions target by 2030 with the demand forecast based on the Additional Transportation Electrification scenario will help identify transmission earlier, since it takes longer to develop transmission compared to generation or storage resources.

16. The electric resource portfolio that meets a 30 MMT GHG emissions target has been tested with production cost modeling and meets the Commission's current standards for system reliability.

17. The electric resource portfolio that meets a 30 MMT GHG emissions target based on updated assumptions includes significantly more renewables and storage resources than the previous portfolio analyzed by the CAISO in its previous TPP.

18. Transmission solutions to support both policy and reliability goals combined with ratepayer savings can provide significant benefits to California.

19. Best practices in transmission planning include cyclical annual study of portfolios that achieve greater GHG reductions and include the need for transmission to support deliverability of the portfolios in a linear fashion, building on prior annual analyses.

20. The Commission's role in the TPP is to select generation and storage resources for the CAISO to study for their transmission needs, not to select specific transmission solutions to be studied.

Conclusions of Law

1. Commission staff should continue to produce baseline generator lists for both D.19-11-016 and D.21-06-035 purposes.

2. The Commission should authorize staff to facilitate, via Tier 2 Advice Letter filings, baseline "swap" arrangements, where an individual LSE may count a resource listed on the baseline generator list for D.19-11-016 and/or D.21-06-035 and instead add a commensurate amount to its 2025 procurement obligation in D.21-06-035, based on the appropriate ELCC values, depending on which order the resource is being used to comply with and the timing of the obligation.

3. CAM resources should not be eligible to participate in a baseline resource swap for reasons of cost allocation fairness.

4. The Cal Advocates proposal for an additional 4,000 MW NQC of procurement is reasonable and should be adopted, with modifications.

5. For ease of compliance, additional resource requirements of 4,000 MW NQC should be in addition to the resources ordered in D.21-06-035 and should utilize the same eligibility and compliance rules as D.21-06-035, unless otherwise specified in this decision.

6. The additional 4,000 MW NQC of procurement required herein should be divided between 2026 and 2027 compliance years, to be online by June 1 of each year.

7. The D.21-06-035 2,000 MW NQC requirements for LLT resources that were due in 2026 should be adjusted to be required before 2028, similar to the timeframe already provided for in D.21-06-035. An LSE should not be required to seek an extension of the 2026 deadline, but should instead be allowed to use the LLT resources defined in D.21-06-035 to count toward its obligations at any

time during 2026 through 2028. If an LSE already has procured its share of the LLT resources by 2026 or 2027, it may substitute that resource for the requirements of this order and conduct additional procurement in 2028, such that in each year the total procurement obligations of all LSEs will be met with 2,000 MW NQC in each year, inclusive of the LLT resources.

8. Capacity requirements to individual LSEs should be on the same basis as assigned in D.21-06-035, for reasons of fairness in cost allocation.

9. The semi-annual filing requirements for procurement data discussed in D.20-12-044 and D.21-06-035 should be continued in perpetuity, unless and until the Commission modifies this process. Compliance and the need for backstop procurement should continue to be evaluated after the receipt of data on February 1 of each year.

10. Backstop procurement, if ordered, should be covered and the costs allocated for a period of ten years.

11. Energy and storage contracts to comply with the D.21-06-035 category of resources to replace Diablo Canyon capacity should be able to be procured separately, but must be contracted by the LSE that is claiming them for compliance purposes. Energy-only contracts may also be used, but only if they can demonstrate by engineering assessment that the energy delivered will be sufficient to charge the batteries and discharge according to the D.21-06-035 and staff FAQ document requirements.

12. Firm import contracts from any resource and with any counterparty should be allowed to be used as bridge resources until such time as new resources can come online, for a period of not more than ten years.

13. It is reasonable to allow an LSE to split the capacity associated with a single resource between its D.19-11-016 and D.21-06-035 compliance obligations,

as long as the resource meets all of the requirements of the decision for which it is being counted, including being incremental to the respective decision's baseline generator list of resources.

14. Trading of compliance obligations between LSEs is reasonable and should be permitted. A Tier 2 Advice Letter notifying the Commission and stakeholders of such a trade arrangement should be required.

15. CAM cost recovery is the most reasonable approach to the situation where an IOU takes on the D.21-06-035 or this order's compliance obligations because the LSE is in bankruptcy or no longer providing retail service, if the LSE's customers are not already paying for the same capacity under the MCAM mechanism.

16. Pseudo-tied and dynamically-scheduled projects should be allowed to count toward the obligations of D.21-06-035 and this order even if they do not yet have a MIC allocation, as long as the LSE documents that it is taking steps to obtain the MIC allocation.

17. To the extent possible, portfolios used for TPP purposes should be based on the most up-to-date assumptions included in the CEC's annual IEPR.

18. Based on analysis conducted by Commission staff thus far, utilizing the electric resource portfolio that meets the 30 MMT GHG emissions target as a reliability and policy-driven base case in the TPP will likely result in the need for new transmission investment to make the portfolio deliverable. Transmission projects should be evaluated for reliability, policy, and economic benefits.

19. The Commission should seek CAISO TPP analysis of one sensitivity case in this TPP cycle: a case that tests the transmission needs of a significant amount of offshore wind.

20. Demonstration of commercial interest in projects in particular geographic areas, as represented by having a place in the CAISO's or other regions' interconnection queues, is reasonable to remain one major driver of the methodology for resource-to-busbar mapping, since it is more likely that those projects will be built compared with projects not in interconnection queues.

21. Additional busbar mapping considerations should include prioritizing locations where gas plants may retire, in disadvantaged communities and/or air quality non-attainment areas, and taking into consideration overall environmental impacts.

O R D E R

IT IS ORDERED that:

1. Any load-serving entity subject to procurement requirements from Decision (D.) 19-11-016 or D.21-06-035 may file a Tier 2 Advice Letter seeking to count an individual electric generation or storage resource listed on the baseline generator list for either decision toward its obligation, but then must have an equal amount of net qualifying capacity added to its procurement requirement associated with D.21-06-035 for 2025. The capacity counting will be based on the relevant effective load carrying capability (ELCC) value for the order for which the resource is being counted, and the additional 2025 capacity procurement will be based on 2025 ELCC values. Commission staff shall maintain on our web site and up-to-date baseline generator list for both D.19-11-016 and D.21-06-035 compliance purposes. Resources with costs allocated under the Cost Allocation Mechanism shall not be eligible for this capacity swap.

2. All load-serving entities (LSEs) required to procure capacity by Decision (D.) 21-06-035 shall procure an additional combined total of 2,000 megawatts of September net qualifying capacity (NQC) from non-emitting, storage, and/or

renewable resources in 2026 and 2027, with resources required to be online by June 1 of each year. The long lead-time resources required by D.21-06-035 may be procured at any time during 2026 through 2028, such that the total NQC of all LSEs adds to 2,000 MW in each of the years 2026, 2027, and 2028. LSEs are not required to make extension requests to postpone their long lead-time resource procurement to 2028.

3. The allocation of net qualifying capacity obligations described in Ordering Paragraph 2 to individual load serving entities (LSEs) shall be done using the same method as described in Decision 21-06-035, using a combination of both the 2021 year-ahead resource adequacy forecasts and energy load forecasts of individual LSEs for 2021 from the 2020 Integrated Energy Policy Report of the California Energy Commission, adopted in February 2021.

4. All load serving entities subject to our integrated resource planning oversight shall continue making procurement data filings on February 1 and August 1 of each year unless and until the Commission sets different requirements. Compliance and the need for backstop procurement as discussed in Decisions 20-12-044 and 21-06-035 shall continue to be evaluated each year after receipt and analysis of the procurement data filed on February 1.

5. Any penalties associated with failure to comply with the requirements of Decision 21-06-035 or this order will be based on a calculation of the net cost of new entry, a calculation which the Commission will maintain for this purpose. The penalty will be assessed for each relevant compliance year.

6. In order to comply with the category of resources required by Decision (D.) 21-06-035 to replace capacity from the Diablo Canyon Power Plant, a load serving entity (LSE) may procure energy and battery resources separately, but both resources must be contracted by the same LSE to be used for compliance.

Energy-energy renewables may also be used to satisfy the Diablo Canyon capacity replacement requirements, but only if accompanied by an engineering assessment that the energy delivered will be sufficient to charge the batteries so that they may discharge to meet the resource requirements in D.21-06-035.

7. For enhanced reliability purposes and compliance with the capacity required by Decision 21-06-035 or this order, a load serving entity may contract for firm imports as a bridge until the online date of a new compliance resource, from any resource and with any counterparty, for a period of not more than ten years.

8. For purposes of compliance with the requirements of Decision (D.) 19-11-016, D.21-06-035, and this order, one load serving entity may split the capacity associated with a single resource (project) between more than one decision's compliance obligation, as long as the resource meets the requirements of the decision for which it is being counted, including being incremental to the baseline generator list of resources for the relevant decision.

9. Any two load serving entities with compliance obligations under Decision (D.) 19-11-016, D.21-06-035, and/or this order shall notify the Commission of a trade of compliance obligations by filing a Tier 2 Advice Letter providing documentation of the trade arrangement.

10. If an investor-owned utility takes on the compliance obligation of another load serving entity (LSE) due to a bankruptcy or other reason for the LSE no longer providing retail service, cost recovery for capacity procurement shall be through the Cost Allocation Mechanism unless the LSE's customers are already paying for the same capacity under the Modified Cost Allocation described in Decision 22-05-015.

11. All load serving entities with capacity obligations under this order and Decision 21-06-035 may count pseudo-tied and/or dynamically-scheduled projects without maximum import capability (MIC) allocations towards their obligations if they demonstrate and document in their data filings that they are taking steps to obtain the MIC allocation.

12. The Commission transfers to the California Independent System Operator for its 2023-2024 Transmission Planning Process the reliability and policy-driven base case portfolio that meets the 30 million metric ton greenhouse gas emissions target by 2030, with updated assumptions from California Energy Commission's 2021 Integrated Energy Policy Report, including using the Additional Transportation Electrification scenario of the demand forecast, using the resource-to-busbar mapping methodology detailed in Attachment A of this order. The details of the portfolio are available at the following link: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

13. The Commission transfers to the California Independent System Operator for its 2023-2024 Transmission Planning Process one policy-driven sensitivity portfolio for study purposes, that has been updated with assumptions from the California Energy Commission's 2021 Integrated Energy Policy Report: a portfolio that tests the transmission needs associated with approximately 13 gigawatts of offshore wind. The details of the portfolio will be posted at the following link: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

14. In mapping electric resources to busbars to identify geographic locations to support the California Independent System Operator's Transmission Planning Process, Commission staff shall prioritize commercial interest, but shall also balance it with other criteria and considerations.

This order is effective today.

Dated ___________________, at San Francisco, California.

ATTACHMENT A

Modeling Assumptions for the 2023-2024
Transmission Planning Process