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Filer:	Rhetta DeMesa
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Offshore Wind in the CPUC's Integrated Resource Planning (IRP) Portfolios

CEC Workshop
November 10, 2022

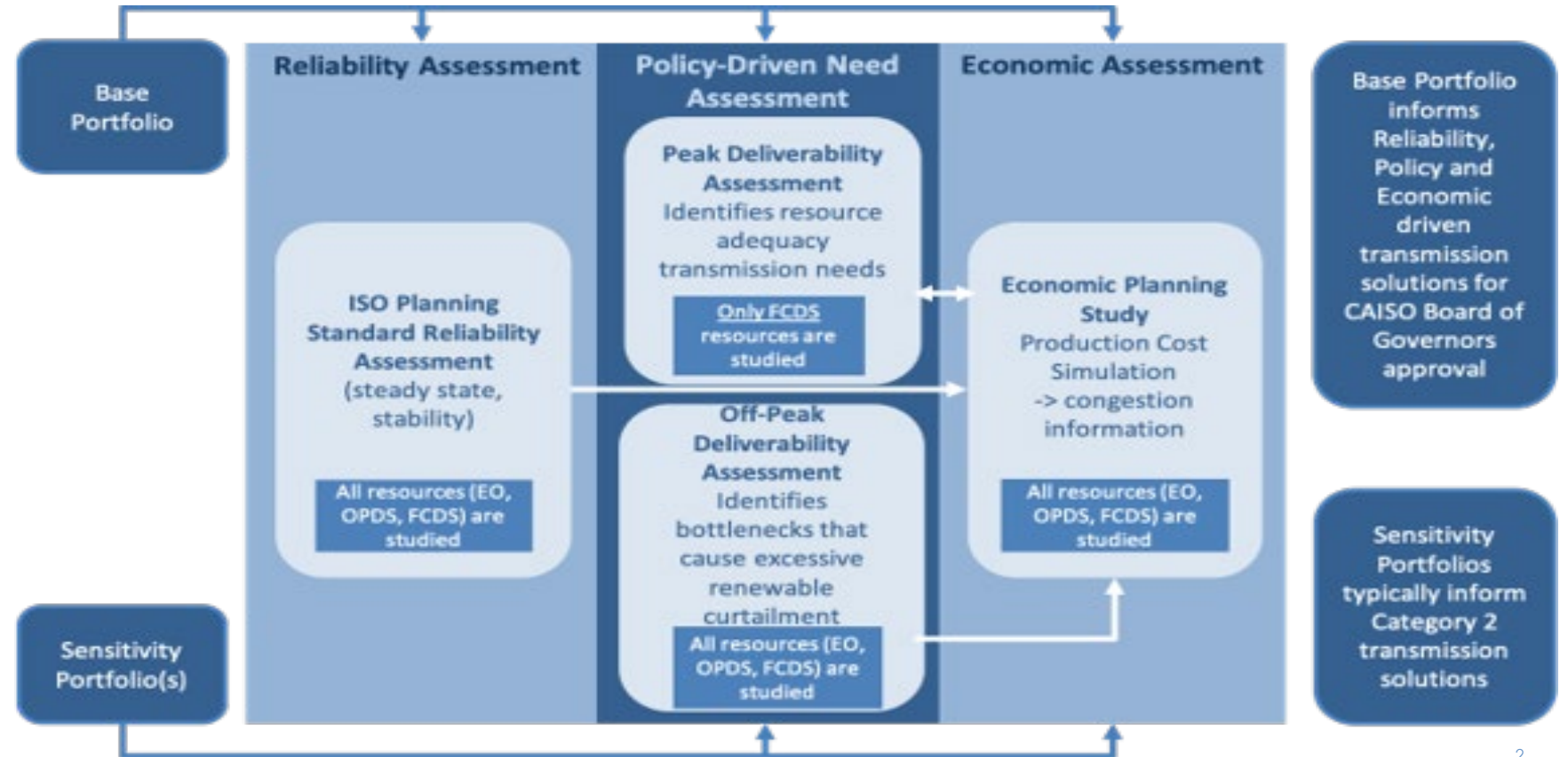


California Public
Utilities Commission

Interaction with the CAISO's Transmission Planning Process (TPP)

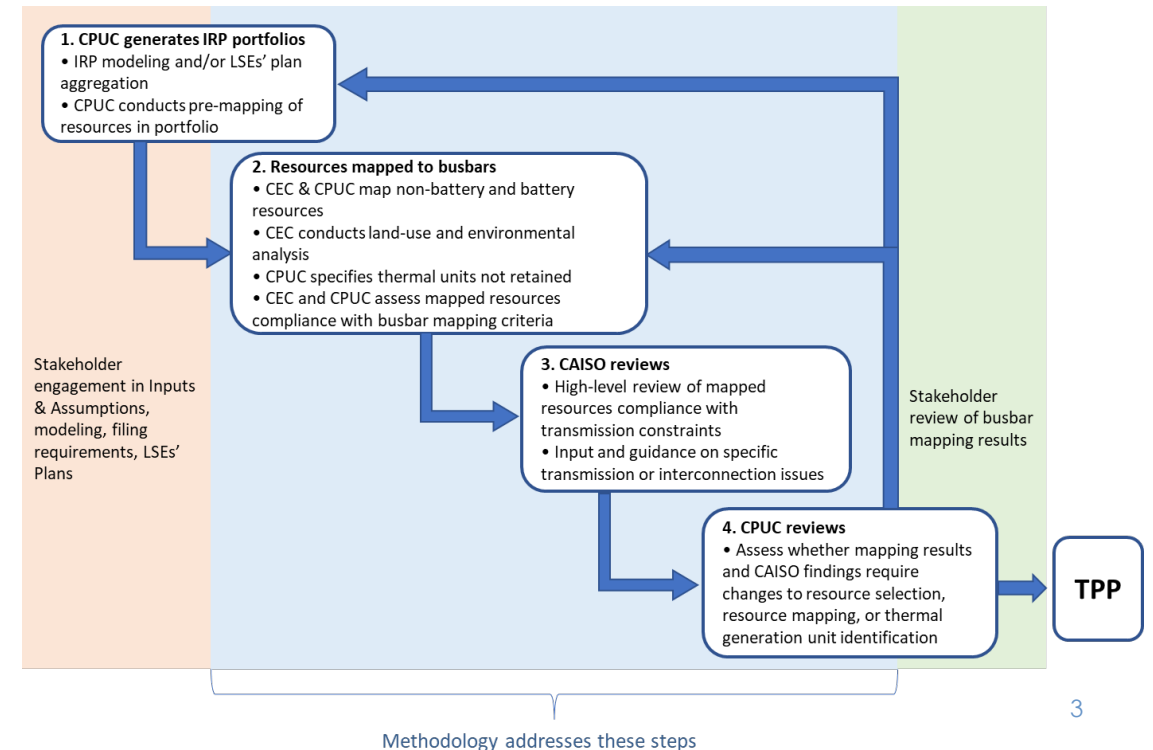
- CAISO's TPP is an annual comprehensive evaluation of the CAISO transmission system to address grid reliability requirements and identify upgrades needed to successfully meet California's policy goals. Historically it has focused on grid needs 10-years out.
- For each TPP, the CAISO uses CPUC resource portfolios and CEC demand forecasts.

- The CPUC typically transmits multiple distinct portfolios developed in the IRP process:
 - Reliability and Policy-Driven Base Case portfolio
 - Policy-Driven Sensitivity portfolio(s)

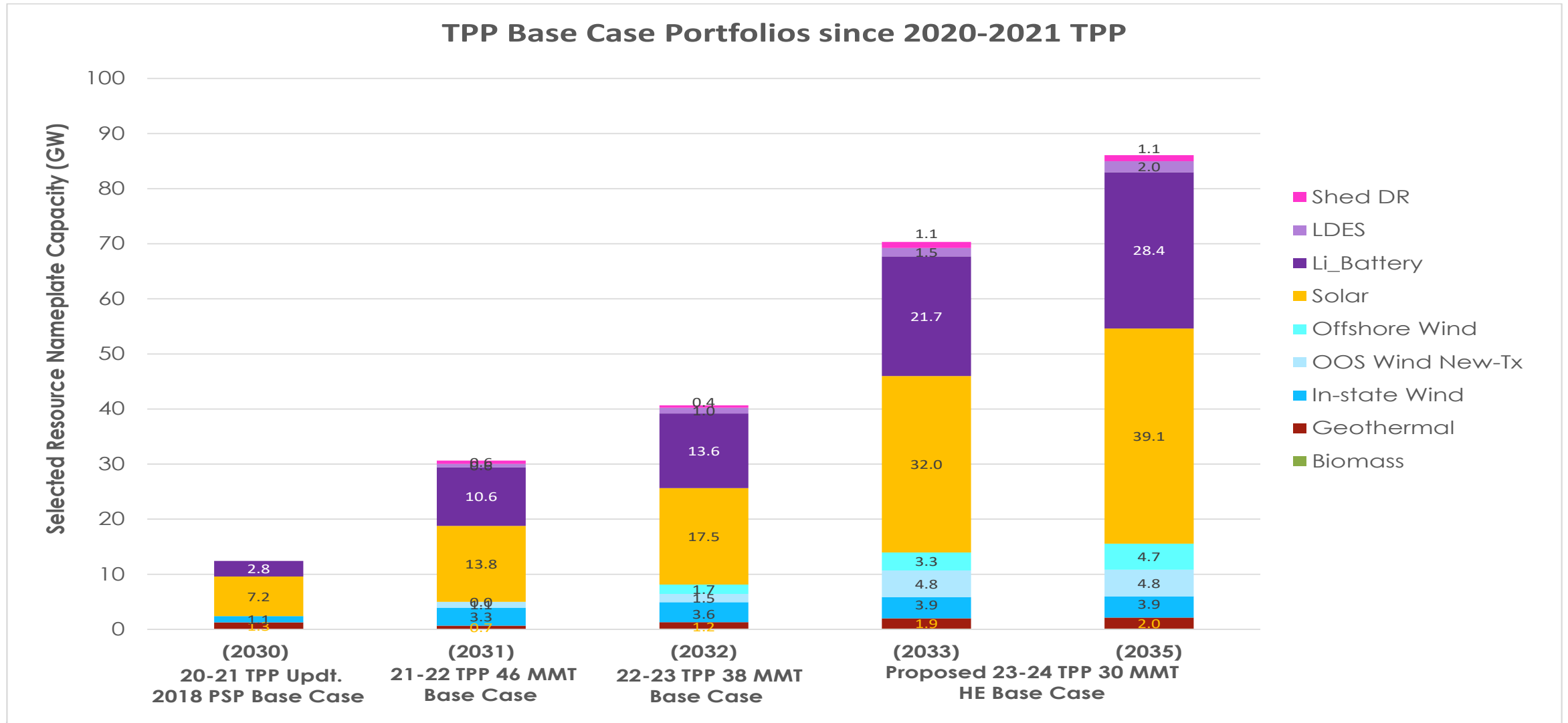


CPUC Maps Resources to Busbars for TPP Analysis

- **Resource to Busbar Mapping** (“busbar mapping”): The process of refining the geographically coarse portfolios developed through IRP to specific interconnection locations (i.e. substations) for analysis in the CAISO’s annual Transmission Planning Process (TPP).
 - First conducted as “proof of concept” for the 2018-2019 TPP portfolio
 - Formalized into a joint effort by a working group comprised of CPUC, CEC, and CAISO staff.
 - Mapping is conducted based on stakeholder vetted methodology.
- **Busbar Mapping Scope:** Mapping focuses on utility-scale generation and storage resources that are not already in baseline.
- **Busbar Mapping Methodology:** Methodology document states guiding principles, establishes mapping criteria, and outlines the iterative inter-agency mapping process.
 - Current proposed [Methodology](#) makes only minor refinements to previous version used for the 22-23 TPP mapping efforts.



Base Case Portfolios since the 2020-2021 TPP



2021-2022 TPP Cycle (Most Recently Completed)

- CPUC conveyed in [D.21-02-008](#) the reliability and policy-driven base case portfolio that meets a 46 million metric ton (MMT) greenhouse gas (GHG) emissions target by 2031.
 - The Decision also conveyed a policy-driven sensitivity portfolio that included a large segment of offshore wind resources, so to improve the transmission assumptions relevant to offshore wind for the benefit of future planning.
- CAISO's [2021-2022 Transmission Plan](#) approved \$3 billion in new transmission projects that are needed to ensure grid reliability and deliverability of projected renewable resources.
 - CAISO also analyzed constraints and transmission implications from 8,350 MW of offshore wind in north and central coast wind areas.

2022-2023 TPP Cycle (Ongoing)

- CPUC adopted in [D.22-02-004](#) the “Preferred System Plan” for the CAISO’s analysis in this current TPP. This portfolio adopts a 38 MMT target for GHG emissions by 2030, which drops to 35 MMT by 2032.
 - This base portfolio includes 1.7 GW of offshore wind in 2032.
 - CAISO also was asked (see [Transmittal Letter](#)) to analyze a [portfolio](#) with a 30 MMT emission limit using high electrification demand assumptions. This sensitivity portfolio includes 4.7 GW of offshore wind in 2035.
- CAISO’s analysis is ongoing.
 - CAISO’s draft Transmission Plan will likely be posted March 31, 2023 and brought to its Board for approval in May 2023.

2023-2024 TPP Cycle (Upcoming)

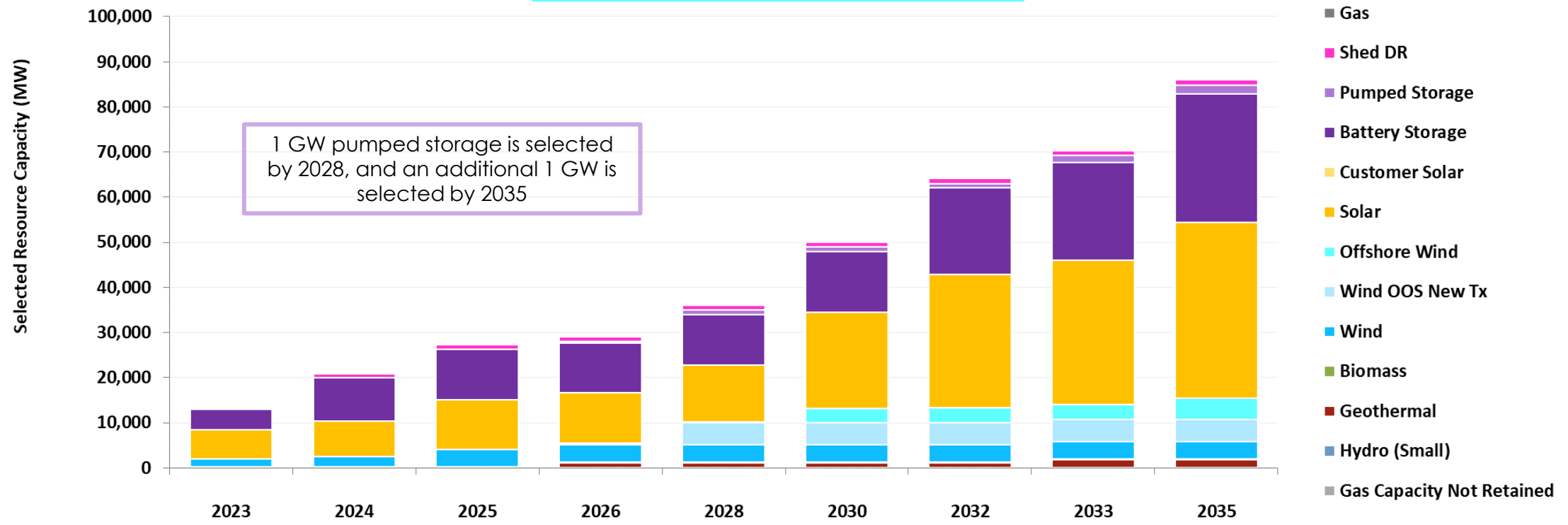
- CPUC staff proposed (through 10/7/2022 [ALJ ruling](#) within R.20-05-003) the portfolios to be analyzed by the CAISO in the TPP that begins next year.
- The recommendation for this actionable base case is a portfolio with a 30 MMT emissions target in 2030 with a high load assumption using the CEC's "2021 IEPR Additional Transportation Electrification" scenario.
 - Also recommended for CAISO analysis: two complementary sensitivity portfolios designed to identify transmission needs associated with offshore wind.

Selected resources for Proposed 30 MMT 2023-2024 TPP HE Base Portfolio

28.4 GW battery storage built by 2035

4.8 GW of out-of-state wind is selected by 2028, 3.1 GW offshore wind is selected in 2030, and 1.6 GW additional selected by 2035

2.1 GW in-state wind added between 2023 and 2025



1 GW pumped storage is selected by 2028, and an additional 1 GW is selected by 2035

11 GW solar deployed by 2025 (hitting annual deployment limit), and an additional 28 GW is selected between 2025 and 2035

1 GW geothermal selected by 2026, and an additional 0.9 GW selected by 2035

0.1 GW additional biomass and 0.1 GW new gas by 2035

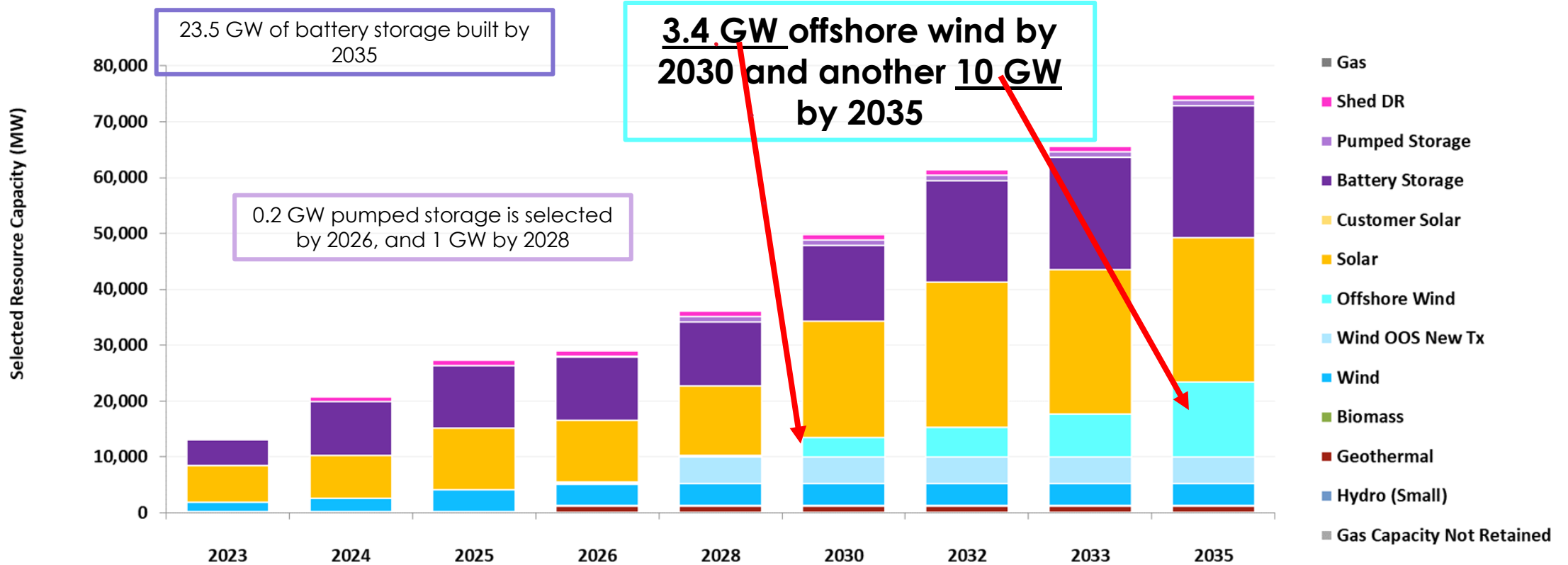
Total resource additions for Proposed 30 MMT 2023-2024 TPP Base Portfolio

	Unit	2023	2024	2025	2026	2028	2030	2032	2033	2035
Gas	MW	-	-	-	-	0	0	0	0	128
Biomass	MW	65	83	107	107	134	134	134	134	134
Geothermal	MW	114	114	114	1,095	1,151	1,151	1,151	1,863	1,863
Hydro (Small)	MW	-	-	-	-	-	-	-	-	-
Wind	MW	1,719	2,319	3,864	3,864	3,864	3,864	3,864	3,864	3,864
Wind OOS New Tx	MW	-	-	-	312	4,828	4,828	4,828	4,828	4,828
Offshore Wind	MW	-	-	-	120	195	3,100	3,261	3,261	4,707
Solar	MW	6,549	7,750	11,000	11,073	12,516	21,367	29,553	32,025	39,072
Customer Solar	MW	-	-	-	-	-	-	-	-	-
Battery Storage	MW	4,603	9,648	11,145	11,145	11,301	13,529	19,205	21,738	28,381
Pumped Storage	MW	-	-	-	196	1,000	1,000	1,000	1,524	2,000
Shed DR	MW	63	889	1,111	1,111	1,111	1,111	1,111	1,111	1,111
<i>Gas Capacity Not Retained</i>	MW	-	-	-	-	-	-	-	-	-
Storage + DR	MW	4,666	10,537	12,257	12,453	13,413	15,640	21,316	24,373	31,492
Total Resources (Renewables + Storage + DR)	MW	13,113	20,804	27,342	29,025	36,102	50,085	64,108	70,349	86,089

Proposed Sensitivity Portfolios

- CPUC staff recommend two sensitivity portfolios for the 2023-2024 TPP
 - Both portfolios still optimize around the 30 MMT by 2030 GHG target and the CEC's 2021 IEPR ATE grid planning scenario and model out to 2035.
1. Offshore Wind Sensitivity Portfolio
 - **Purpose:** Refine and update transmission capability and upgrade assumptions relevant to offshore wind resources, including AB 525 planning goals and updated resource potential assumptions,
 - 13.4 GW forced-in capacity of offshore wind resources by 2035
 - Morro Bay: 5.4 GW
 - Humboldt: 3 GW
 - Cape Mendocino or Del Norte: 5 GW
 2. Limited Offshore and Out-of-state Wind Sensitivity Portfolio
 - **Purpose:** Study transmission implications of a significantly different resource mix if key long lead-time resources are slow to develop; and aid in identifying “least regrets” transmission options that would be beneficial under a variety of resource mix futures.
 - Limit Offshore and Out-of-state wind on new transmission to 2 GW each through the 2035 build year.
 - Prohibited RESOLVE from selecting new gas through 2035

Total resource additions for Proposed 30 MMT additional offshore wind sensitivity



11 GW solar deployed by 2025 (hitting annual deployment limit), and an additional 14.8 GW is selected between 2025 and 2035.

1 GW geothermal selected by 2026

0.1 GW new biomass and no new gas additions by 2035

Total resource additions for Proposed 30 MMT additional offshore wind sensitivity

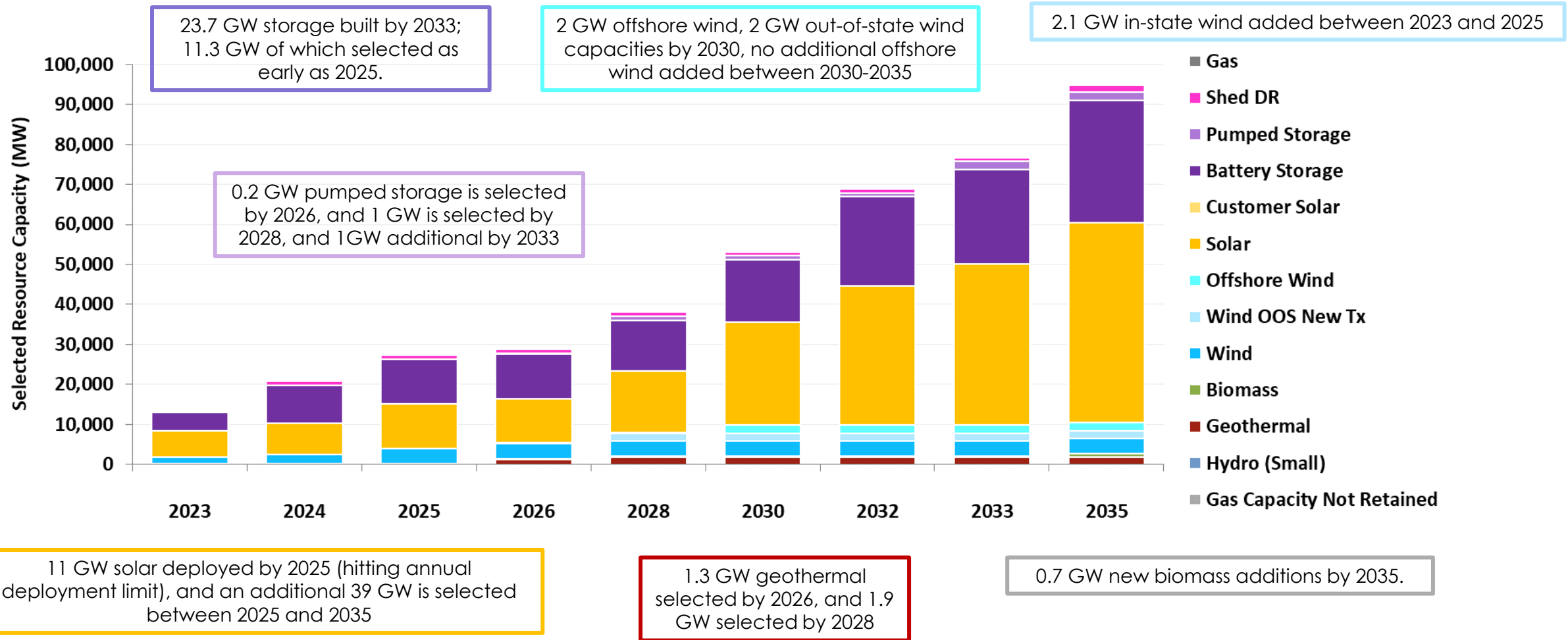
	Unit	2023	2024	2025	2026	2028	2030	2032	2033	2035
Gas	MW	-	-	-	-	-	-	-	-	-
Biomass	MW	65	83	107	107	134	134	134	134	134
Geothermal	MW	114	114	114	1,117	1,149	1,149	1,149	1,149	1,149
Hydro (Small)	MW	-	-	-	-	-	-	-	-	-
Wind	MW	1,719	2,319	3,864	3,864	3,864	3,864	3,864	3,864	3,864
Wind OOS New Tx	MW	-	-	-	283	4,828	4,828	4,828	4,828	4,828
Offshore Wind	MW	-	-	-	120	195	3,449	5,355	7,656	13,400
Solar	MW	6,549	7,750	11,000	11,014	12,472	20,895	25,871	25,871	25,871
Customer Solar	MW	-	-	-	-	-	-	-	-	-
Battery Storage	MW	4,603	9,597	11,279	11,279	11,452	13,543	18,221	20,072	23,553
Pumped Storage	MW	-	-	-	196	1,000	1,000	1,000	1,000	1,000
Shed DR	MW	63	889	977	977	977	977	977	977	977
Gas Capacity Not Retained	MW	-	-	-	-	-	-	-	-	-
Storage + DR	MW	4,666	10,486	12,256	12,452	13,429	15,520	20,199	22,049	25,530
Total Resources (Renewables + Storage + DR)	MW	13,113	20,753	27,341	28,957	36,072	49,839	61,401	65,552	74,777

13.4 GW forced-in capacity

Compared to the 30 MMT TPP 2023-2024 case:

- By 2035, there is 8.7 GW incremental offshore wind resulting in 0.7 GW less geothermal, 13.2 GW less solar, 4.8 GW less battery storage, 1 GW less pumped storage

Selected Resources for Proposed 30 MMT limited offshore and out-of-state wind sensitivity



Selected Resources for Proposed 30 MMT limited offshore and out-of-state wind sensitivity

	Unit	2023	2024	2025	2026	2028	2030	2032	2033	2035
Gas	MW	-	-	-	-	-	-	-	-	-
Biomass	MW	65	83	107	107	134	134	134	134	699
Geothermal	MW	114	114	114	1,306	1,826	1,826	1,826	1,885	1,885
Hydro (Small)	MW	-	-	-	-	-	-	-	-	-
Wind	MW	1,719	2,319	3,797	3,797	3,797	3,797	3,797	3,797	3,797
Wind OOS New Tx	MW	-	-	-	-	2,000	2,000	2,000	2,000	2,000
Offshore Wind	MW	-	-	-	120	195	2,000	2,000	2,000	2,000
Solar	MW	6,549	7,750	11,000	11,009	15,448	25,905	34,966	40,193	49,961
Customer Solar	MW	-	-	-	-	-	-	-	-	-
Battery Storage	MW	4,603	9,571	11,252	11,252	12,629	15,504	22,173	23,741	30,713
Pumped Storage	MW	-	-	-	196	1,000	1,000	1,000	2,000	2,000
Shed DR	MW	63	889	977	977	977	977	977	977	1,716
Gas Capacity Not Retained	MW	-	-	-	-	-	-	-	-	-
Storage + DR	MW	4,666	10,460	12,229	12,425	14,606	17,481	24,150	26,718	34,429
Total Resources (Renewables + Storage + DR)	MW	13,113	20,727	27,248	28,765	38,007	53,143	68,874	76,728	94,771

Compared to the 30 MMT TPP 2023-2024 case:

- By 2035, 2.8 GW less out-of-state wind, 2.7 GW less offshore wind, 10.9 GW more solar, 2.3 GW more battery storage, 0.6 GW more biomass, and 0.6 GW more DR