

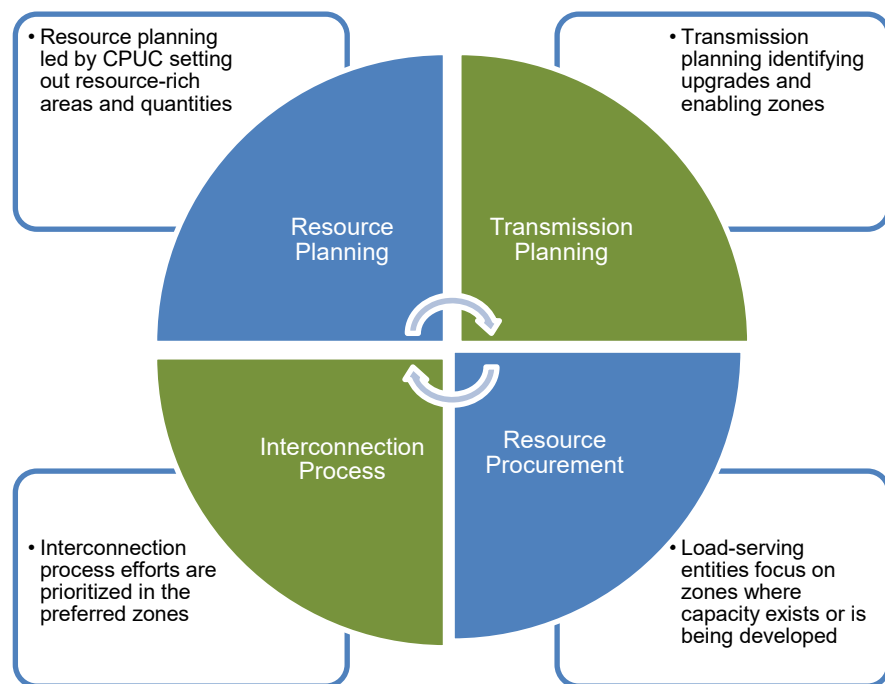


California ISO – Transmission Planning

California ISO, Inter-regional Coordination
2024 Annual Western Interregional Coordination Meeting

March 26, 2024

The ISO's transmission planning process focuses on the zonal approach to address rapidly increasing resource development need



The strategic process alignment to manage the transformational change was established in the CPUC/CEC/ISO Memorandum of Understanding signed in December, 2022 to:

- Tighten the linkage between:
 - Resource and transmission planning,
 - Procurement direction, and
 - ISO interconnection process.
- Create a formal linkage between CEC SB 100/IEPR activities and the ISO and CPUC processes
- Reaffirm the existing state agency and single forecast set coordination

The ISO leads the transmission planning process for our footprint, coordinated with load forecasts from the CEC and resource planning from the CPUC



- Annual 10-Year transmission plan is the formal approval document for expansion planning in our footprint
 - Ramped from 10 year average of \$650 million per year to \$3 billion in 2021-2022 plan, and \$7.3 billion in 2022-2023 plan
 - Responded to accelerating load growth and escalating renewable energy needs
 - Focuses on most efficient and effective long term solutions – including Grid Enhancing Technologies and non-wires solutions
- 20 Year Outlook assesses longer term needs
 - First prepared in 2022, being updated in 2024
 - Establishes a longer term direction and strategy
 - Provides context for nearer term decision
 - Informs going-forward resource planning decisions

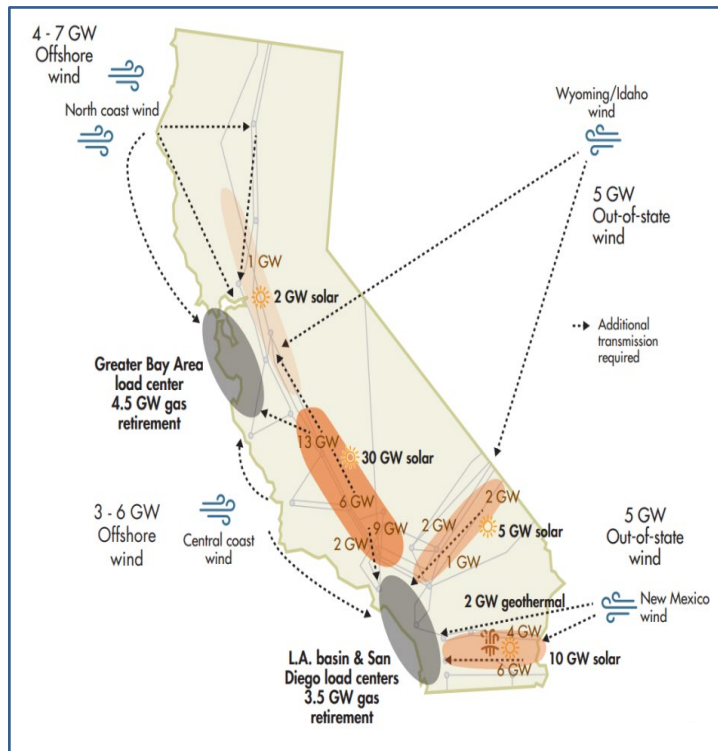


The ISO continues to advance inter-regional transmission planning projects

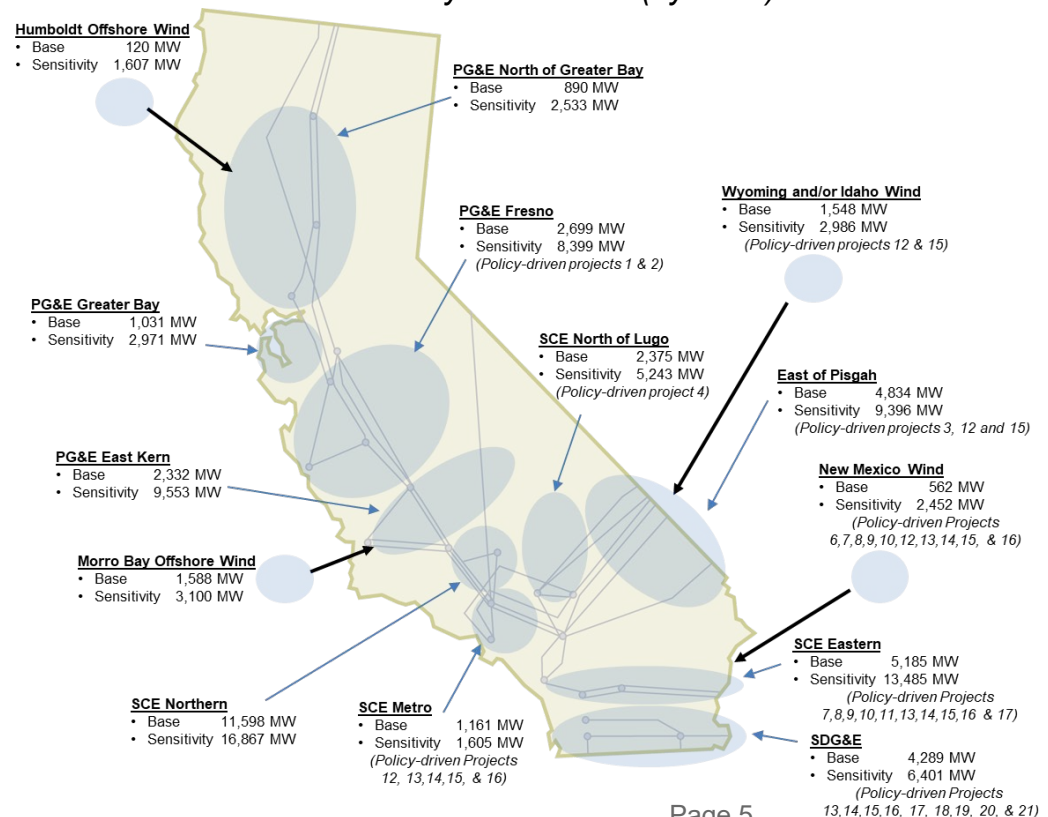
- In December 2023, the ISO conditionally approved participation in a joint effort with Idaho Power for the “SWIP North” transmission project
 - Providing access to over 1000 MW of Idaho resources to California
- Developed a subscriber participating transmission owner framework facilitating merchant transmission to bring renewable energy to the California border
 - Two major projects have applied to join the ISO using this framework – TransWest Express and Sunzia
 - Transmission development costs included in power purchase agreement with load-serving entity rather than Transmission Access Charge

The transmission plan emphasizes a zonal approach aligned with the ISO's 20-year Outlook, which also informs interconnection and resource procurement

CAISO 20-year Transmission Outlook – 2022
120 GW new additions by 2040
(Being updated in Q2, 2024)



CAISO 2022-2023 Transmission Plan approved in May, 2023 met the needs of the 40 GW base case and most of the 70 GW sensitivity case needs (by 2032)



The CAISO's 2022-2023 TPP was approved in May 2023

- 24 reliability-driven projects totaling \$1.76 billion
- 21 policy-driven projects totaling \$5.53 billion
- No project driven solely by economic considerations
- Competitive solicitation for:
 - Imperial Valley – North of SONGS 500 kV line and substation;
 - North of SONGS – Serrano 500 kV line, and
 - North Gila – Imperial Valley 500 kV line

<https://www.caiso.com/InitiativeDocuments/ISO-Board-Approved-2022-2023-Transmission-Plan.pdf>



Those needs continued in the 2023-2024 Plan and the basis for updating the 20 Year Transmission Outlook

Resource Type (MW)	2023-2024 Transmission Planning Process		20-Year Transmission Outlook	
	Base Portfolio (2035)	OSW Sensitivity (2035)	May 2022 2040 SB100 Starting Point Scenario (MW)	Update New Resource Assumption in the 2045 Scenario (MW)
Natural Gas Fired Power Plants	-	-	(-15,000)	(-15,000)
Utility-Scale Solar	38,947	25,746	53,212	69,640
Distributed Solar	125	125	-	125
In-state wind	3,074	3,074	2,837	3,074
Offshore wind	5,497	13,400	10,000	20,000
Out-of-state wind	5,618	5,618	12,000	12,000
Geothermal	2,037	1,149	2,332	2,332
Biomass	134	134	-	134
Battery-energy storage	28,373	23,545	37,000	48,813
Long-duration energy storage (pumped storage)	2,000	1,000	4,000	4,000
Generic clean firm/long-duration energy storage	-	-	-	5,000

Some changes in mapping of resources is resulting in some softening of the need for reinforcements in certain high profile areas in the 2023-2024 transmission plan – raising some stakeholder concerns

2023-2024 Transmission Planning Process

Transmission Policy-Driven Projects

- In 2022-2023 TPP where there was a need in base portfolios, alternatives were approved that also met the needs in the sensitivity portfolio - which essentially became the 2023-2024 portfolio
- As a result, many of the needs for the 2023-2024 scenarios were addressed last year
- With offshore wind identified in the base portfolio from the Humboldt call area, transmission development for the North coast will be identified

2023-2024 Transmission Plan Milestones

- Draft Study Plan posted on February 23
- Stakeholder meeting on Draft Study Plan on February 28
 - Comments submitted by March 14
- Final Study Plan posted on August 16
- Preliminary reliability study results posted on August 15
- Stakeholder meeting on September 26 and 27
 - Comments submitted by October 11
- Request window closed October 15
- Preliminary policy and economic study results on November 16
 - Comments to be submitted by November 30
- Draft transmission plan to be posted on March 31, 2024
- Stakeholder meeting April 9, 2024
 - Comments to be submitted within two weeks after stakeholder meeting
- Revised draft for approval at May Board of Governor meeting

2024-2025 Transmission Planning Process

January 2024

Phase 1 – Develop detailed study plan

State and federal policy
CEC - Demand forecasts
CPUC - Resource forecasts and common assumptions with procurement processes
Other issues or concerns

April 2024

Phase 2 - Sequential technical studies

- Reliability analysis
- Renewable (policy-driven) analysis
- Economic analysis

Publish comprehensive transmission plan with recommended projects

May 2024

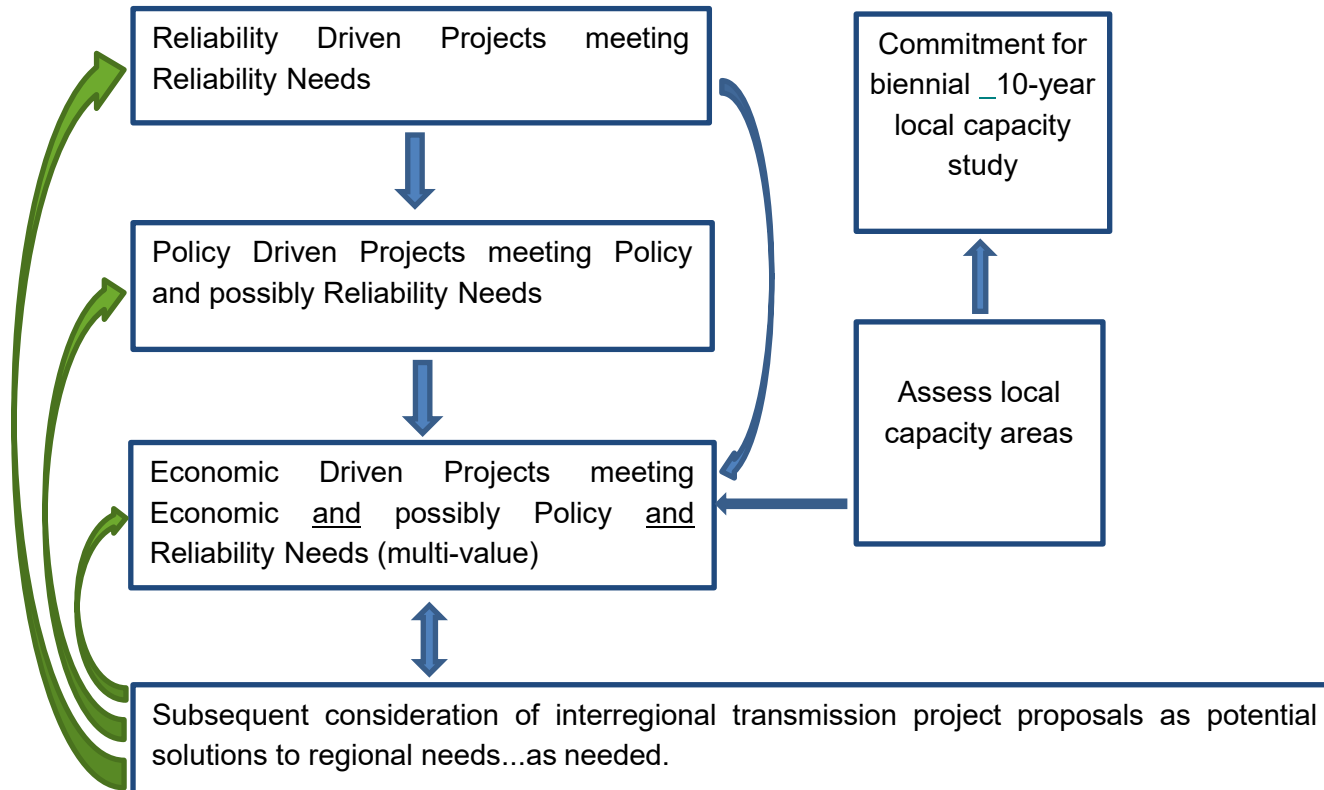
Phase 3 Procurement

CAISO Board for approval of transmission plan

2024-2025 Transmission Plan Milestones

- Draft Study Plan posted on February 21
- Stakeholder meeting on Draft Study Plan on February 28
 - Comments to be submitted by March 13
- Final Study Plan to be posted in April
- Preliminary reliability study results to be posted on August 15
- Stakeholder meeting on September 26 and 27
 - Comments to be submitted by October 11
- Request window closes October 15
- Preliminary policy and economic study results on November 14
 - Comments to be submitted by November 28
- Draft transmission plan to be posted on March 31, 2025
- Stakeholder meeting in April 2025
 - Comments to be submitted within two weeks after stakeholder meeting
- Revised draft for approval at May 2025 Board of Governor meeting

Studies are coordinated as a part of the transmission planning process



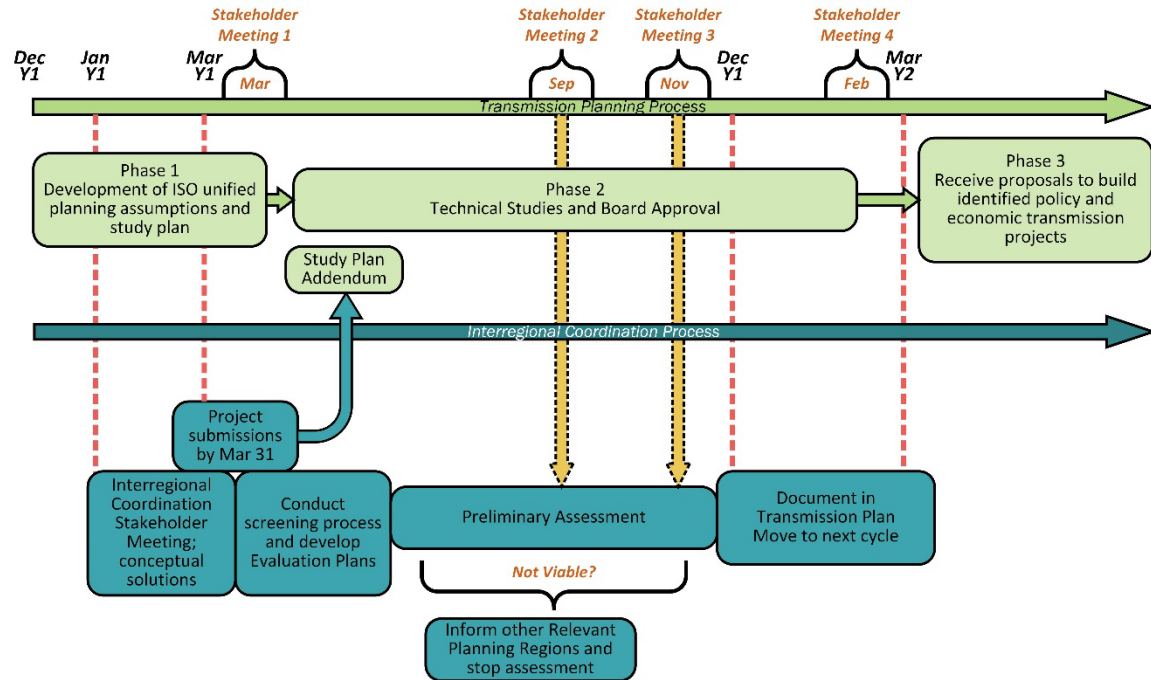
2024-2025 Transmission Plan Study Plan

- Reliability Assessment to identify reliability-driven needs
- Policy Assessment to identify policy-driven needs
- Economic Planning Studies to identify needed economically-driven elements
- Other Studies
 - Near-Term / Long-Term Local Capacity Requirement (LCR)
 - Maximum Import Capability expansion requests
 - Long-term Congestion Revenue Rights
 - Frequency response
- No special studies are currently planned for the 2024-2025 TPP

Interregional Transmission Coordination - Year 1 of 2

- Host an open window (January 1 through March 31) for proposed interregional transmission projects to be submitted to the CAISO for consideration in the CAISO's 2024-2025 TPP planning cycle
- Participate in a western planning regions' stakeholder meeting. The Northern Grid is hosting the meeting on March 26, 2024.

Even year Interregional Coordination Process



<http://www.caiso.com/planning/Pages/InterregionalTransmissionCoordination/default.aspx>

Study Areas



- **Northern Area - Bulk**
- **PG&E Local Areas:**
 - Humboldt area
 - North Coast and North Bay area
 - North Valley area
 - Central Valley area
 - Greater Bay area
 - Greater Fresno area
 - Kern area
 - Central Coast and Los Padres areas.
- **Southern Area – Bulk**
- **SCE local areas:**
 - Tehachapi and Big Creek Corridor
 - North of Lugo area
 - East of Lugo area
 - Eastern area
 - Metro area
- **SDG&E area**
- **Valley Electric Association area**
- **ISO combined bulk system**

2024-2025 Transmission Planning Process

Key Inputs

- On February 15, 2024 CPUC adopted a base and a sensitivity portfolio for 2034 and 2039 for use in the 2024-2025 TPP
- 2023 IEPR California Energy Demand forecast adopted by the CEC on February 14, 2024

<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/assumptions-for-the-2024-2025-tpp>

<https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2023-integrated-energy-policy-report>

2024-2025 TPP, Composition of 2034 base and sensitivity portfolios

Resource Type	Base Portfolio			Sensitivity Portfolio		
	FCDS (MW)	EO (MW)	Total (MW)	FCDS (MW)	EO (MW)	Total (MW)
Biomass	171	0	171	22	0	22
Distributed_Solar	260	0	260	329	0	329
Geothermal	1,969	0	1,969	3,961	0	3,961
LDES	1,030	0	1,030	3,280	0	3,280
Li_Battery (4-hour)	14,958	0	14,958	9,305	0	9,305
Li_Battery (8-hour)	1,618	0	1,618	2,867	0	2,867
Offshore Wind	3,855	0	3,855	0	0	0
OOS Wind	6,096	0	6,096	6,066	0	6,066
Solar	8,481	10,248	18,729	10,751	9,479	20,230
Wind, Onshore	5,203	921	6,123	4,885	855	5,739
TOTAL	43,640	11,168	54,808	41,465	10,333	51,799

2024-2025 TPP, Composition of 2039 base and sensitivity portfolios

Resource Type	Base Portfolio			Sensitivity Portfolio		
	FCDS (MW)	EO (MW)	Total (MW)	FCDS (MW)	EO (MW)	Total (MW)
Biomass	171	0	171	22	0	22
Distributed_Solar	283	0	283	335	0	335
Geothermal	1,969	0	1,969	5,089	0	5,089
LDES	1,080	0	1,080	3,680	0	3,680
Li_Battery (4-hour)	15,707	0	15,707	9,305	0	9,305
Li_Battery (8-hour)	7,115	0	7,115	15,612	0	15,612
Offshore Wind	4,531	0	4,531	0	0	0
OOS Wind	9,096	0	9,096	7,066	0	7,066
Solar	10,858	19,541	30,399	21,304	30,547	51,851
Wind, Onshore	6,103	921	7,023	4,885	855	5,739
TOTAL	56,912	20,462	77,374	67,298	31,401	98,699

2024-2025 TPP, Gas generation retirement assumptions in the portfolios

Portfolio	Assumed gas retirements (MW)	
	2034	2039
Base	7,140	8,110
Sensitivity (High gas retirement scenario)	9,130	15,966

- The amounts include about 3,700 MW of scheduled OTC retirements

Out-of-State Wind in Base Portfolios in the ISO's Annual Transmission Planning Process

		2022-2023 TPP (2033)	2023-2024 TPP (2035)	2024-2025 TPP	
				(2035)	(2039)
Idaho Wind	Eldorado	1062	1000	1060	1060
Wyoming Wind	Eldorado		1500	2905	3000
	Tesla				1500
New Mexico Wind	Palo Verde	438	2328	2131	3536
Total OOS Wind		1500	4828	6096	9096

Note in 2022-2023 TPP 1,062 MW of out-of-state (OOS) wind was identified from either Wyoming or Idaho

The ISO is working bilaterally as well as through established processes to explore transmission opportunities.

Significant Transmission Projects in the Western Interconnection

1 S-Line Project

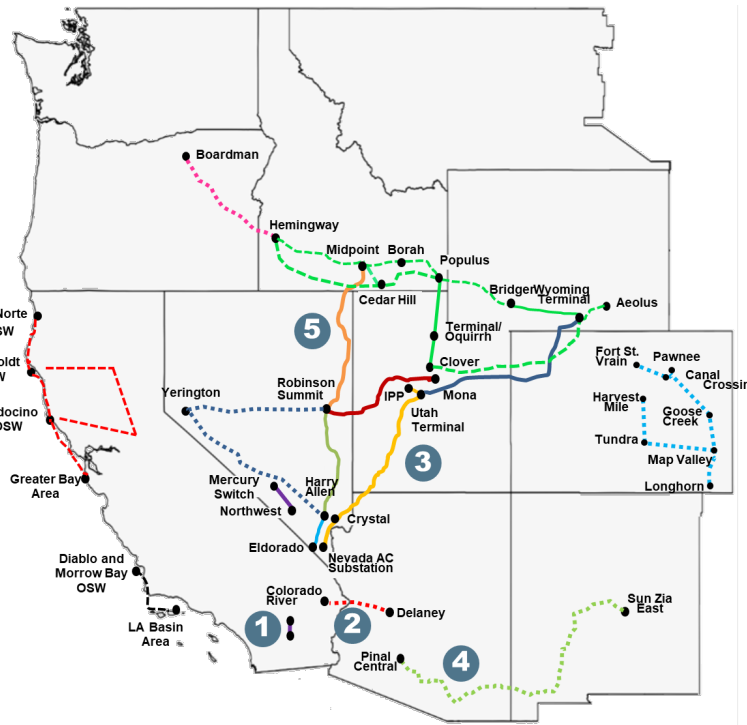
- **Developer:** IID and Citizens Energy
- **Status:** Under construction
- **Expected In-Service Date:** 2024
- **Financing:** CAISO High Voltage Transmission Access Charge rate based
- **Generation Enabled:** Reduces deliverability limitations in addition to economic benefits
- **CAISO Engagement:** Approved as economic-driven transmission project in 2018
- **Partnership/Benefits:** Enables increased bi-directional delivery of supply to IID as well as renewable supply from IID to CAISO. Decreases local requirements in San Diego / Imperial Valley area.

2 Ten West Project

- **Developer:** Lotus Infrastructure Partners
- **Status:** Under construction
- **Expected In-Service Date:** May 2024
- **Financing:** CAISO High Voltage Transmission Access Charge rate-based
- **Generation Enabled:** 1000MW of renewables in Imperial Valley, Palo Verde trading hub
- **CAISO Engagement:** Approved by CAISO Board in 2014 as part of 2013-2014 TPP. Transmission inside CAISO BA.
- **Partnership/Benefits:** Enables additional renewables from Southwest to CAISO as well as increased export capability to the Southwest

3 TransWest Express

- **Developer:** TransWest Express LLC, subsidiary of Anschutz Corp.
- **Status:** Construction started Sept. 2023
- **Expected In-Service Date:** 2027
- **Financing:** Subscriber funded
- **Generation Enabled:** 3000MW of Wyoming wind resources
- **CAISO Engagement:** Line will be in the CAISO BAA and operate under Subscriber Participating Transmission Owner (SPTO) tariff mechanism
- **Partnership/Benefits:** Enables partnership with entities engaged with west-wide development/procurement activity.



4 Sunzia

- **Developer:** Pattern Energy
- **Status:** Construction started July 2023
- **Expected In-Service Date:** 2026
- **Financing:** Merchant subscriber transmission development
- **Generation Enabled:** 3,500MW of New Mexico wind
- **CAISO Engagement:** Submitted application to become subscriber participating transmission owner in January 2024
- **Partnership/Benefits:** Enables access to New Mexico wind by CA and SW load serving entities.

5 Southwest Intertie Project – North (SWIP-N)

- **Developer:** LS Power
- **Status:** Conditionally approved as addendum to 2022-2023 Transmission Plan by CAISO Board Dec. 2023
- **Expected In-Service Date:** End of 2026
- **Financing:** Cost of service rate recovery shared between CAISO and Idaho Power
- **Generation Enabled:** 2000MW of Idaho wind resources
- **CAISO Engagement:** Monitoring requirements of conditions included in the approved addendum to 2022-2023 CAISO Transmission Plan.
- **Partnership/Benefits:** Enables partnership providing mutual benefits to and from Idaho and California while also providing additional transfer capability from Northwest to Southwest entities.

Offshore Wind Resources in Portfolios in the ISO's Annual Transmission Planning Process

	2022-2023 TPP		2023-2024 TPP		2024-20253 TPP	
	Base Portfolio	Sensitivity Porfolio	Base Portfolio	Sensitivity Porfolio	Base (2034)	Base (2039)
Morrow Bay Call Area	1588	3100	3100	5355	2924	2924
Humboldt Call Area	120	1607	1607	2600	931	1607
Del Nort Area	-	-	-	3445		
Cape Mendocino Area	-	-	-	2000		
Total OSW	1708	4707	4707	13400	3855	4531

- The ISO recommends for approval transmission projects that are found needed to meet the needs of the base portfolio

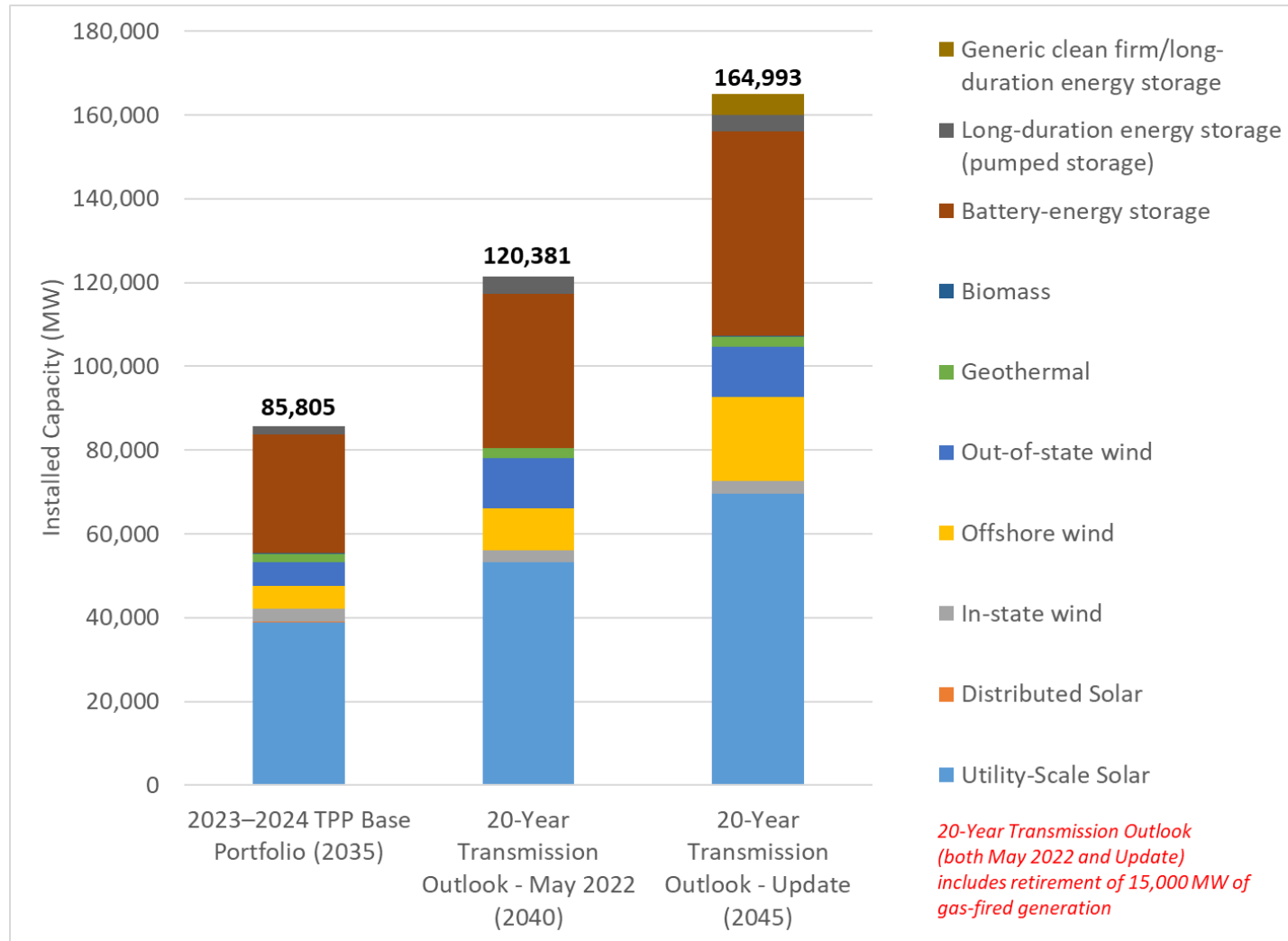
20-Year Transmission Outlook

20 YEAR TRANSMISSION OUTLOOK

- The ISO produced its first ever 20-Year Transmission Outlook focused on providing a longer term view of transmission needed to reliably meet state clean energy goals
- Issued in May 2022 and posted on the ISO website
<http://www.caiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf>
- Currently work is underway on the second Transmission Outlook; to be published in May 2024



Portfolios – 2023-2024 Transmission Planning Process and 20-Year Transmission Outlook



Resources mapped to the transmission zones in the 2045 Transmission Outlook

Northern CA Offshore Wind

• Total 14,600 MW

PG&E North of Greater Bay

• Total 6,649 MW

Northern Nevada Geothermal

- North of GB 40 MW
- East of Pisgah 405 MW
- North of Lugo 13 MW

Wyoming and/or Idaho Wind

• Total 6,671 MW

PG&E Greater Bay

• Total 6,638 MW

SCE North of Lugo

• Total 5,994 MW

PG&E Fresno

• Total 27,697 MW

East of Pisgah

• Total 11,246 MW

PG&E East Kern

• Total 13,520 MW

New Mexico Wind

• Total 5,329 MW

Morro Bay Offshore Wind

• Total 5,400 MW

SCE Eastern

• Total 18,164 MW

SCE Northern

• Total 24,286 MW

SCE Metro

• Total 2,201 MW

SDG&E

• Total 12,266 MW

IID

• Total 4,001 MW

Out-of-State Wind – comparison between the 20-Year Transmission Outlook and the ISO’s Transmission Planning Process

		2022-2023 TPP (2033)	2023-2024 TPP (2035)	2024-2025 TPP		20-Year Transmission Outlook (2045)
				(2035)	(2039)	
Idaho Wind	Eldorado	1062	1000	1060	1060	1000
Wyoming Wind	Eldorado		1500	2905	3000	1500
	Tesla				1500	
	TBD					3500
New Mexico Wind	Palo Verde	438	2328	2131	3536	2328
	TBD					2882
Total OOS Wind		1500	4828	6096	9096	11210

Out of state (OOS) wind capacity requiring new transmission, as identified in the portfolios

Out-of-State Wind Modelling Approach

- The new transmission projects could either
 - bring the out-of-state wind to the border of the ISO system, requiring additional transmission within the ISO system, or
 - could be brought to interconnection points within the ISO, such as Tesla and Lugo substations
 - *Note CPUC base portfolio for 2024-2025 TPP identifies 1,500 MW of Wyoming wind to come to Tesla in 2039*
- New transmission projects could potentially facilitate coordination with LADWP and BANC to bring in additional out-of-state wind that may be required for their resource portfolios

Offshore Wind Resources – comparison between the 2045 Transmission Outlook and recent annual TPP

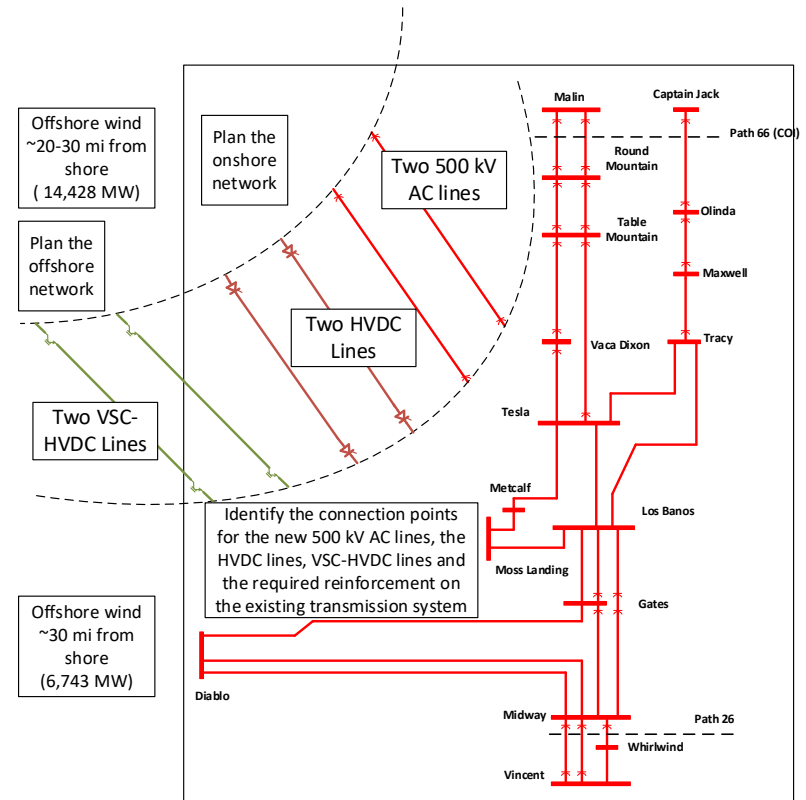
	2022-2023 TPP		2023-2024 TPP		2024-20253 TPP		20-Year Transmission Outlook	
	Base Portfolio	Sensitivity Porfolio	Base Portfolio	Sensitivity Porfolio	Base (2034)	Base (2039)	May 2022	May 2024 Update
Morrow Bay Call Area	1588	3100	3100	5355	2924	2924	6000 ¹	5400
Humboldt Call Area	120	1607	1607	2600	931	1607	4000 ²	2700
Del Nort Area	-	-	-	3445				7000
Cape Mendocino Area	-	-	-	2000				4900
Total OSW	1708	4707	4707	13400	3855	4531	10000	20000

1. Central Coast
2. North Coast

Conceptualization for integrating 14,000 MW of offshore wind from North Coast by 2045

High level assessment of a hybrid transfer path	
500 kV AC line to Fern Road	2
Onshore overhead VSC-HVDC to Collinsville	2
Offshore sea cable VSC-HVDC to Bay Area	2

Technology	Normal Rating Assumptions (MVA)	Emergency Rating Assumptions (MVA)
500 kV AC line to Fern Road	3,500	4,500
Onshore overhead VSC-HVDC to Collinsville Substation	3,000	3,500
Offshore sea cable VSC-HVDC to a Substation in the Bay Area	2,000	2,500



The ISO is engaged in west-wide transmission planning on multiple tracks

Information-sharing to support west-wide study efforts

- FERC Order 1000 interregional coordination planning with WestConnect and Northern Grid
- DOE - congestion study, long term planning study, West Coast Offshore Wind transmission study
- WECC system planning studies
- NERC interregional transfer capability study
- Gridworks/Gridlab/PNNL Connected West initiative
- Western Transmission Expansion Coalition
- Western States Transmission Initiative (CREPC)

Informal discussions with transmission planning peers

- Regional Transmission Planning Discussions

Creative bilateral efforts to advance projects

- Subscriber PTO approach
- Other bilateral arrangements

Monitor and engage in process reform

- WEIM education and engagement on transmission planning efforts
- FERC technical conferences
- Comments on FERC NOPRs
- DOE National Interest Electricity Transmission Corridor (NIETC) comments
- DOE Grid Deployment Office (GDO) loan program support