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)

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- **Humboldt Offshore Wind**
  - Base: 120 MW
  - Sensitivity: 1,607 MW

- **PG&E North of Greater Bay**
  - Base: 860 MW
  - Sensitivity: 2,533 MW

- **PG&E Greater Bay**
  - Base: 1,031 MW
  - Sensitivity: 2,971 MW

- **PG&E East Kern**
  - Base: 2,332 MW
  - Sensitivity: 9,593 MW

- **PG&E Fresno**
  - Base: 2,699 MW
  - Sensitivity: 6,399 MW
  (Policy-driven Projects 1 & 2)

- **Wyoming and/or Idaho Wind**
  - Base: 1,548 MW
  - Sensitivity: 2,988 MW
  (Policy-driven projects 12 & 15)

- **New Mexico Wind**
  - Base: 162 MW
  - Sensitivity: 2,452 MW
  (Policy-driven Projects 6, 7, 8, 9, 10, 12, 13, 14, 15, & 16)

- **SCE North of Lugo**
  - Base: 2,375 MW
  - Sensitivity: 5,243 MW
  (Policy-driven Projects 12 & 17)

- **SCE Northern**
  - Base: 11,598 MW
  - Sensitivity: 16,867 MW

- **SCE Metro**
  - Base: 1,161 MW
  - Sensitivity: 1,000 MW
  (Policy-driven Projects 12, 13, 14, 15, & 16)

- **SCE Eastern**
  - Base: 5,185 MW
  - Sensitivity: 13,485 MW
  (Policy-driven Projects 7, 8, 9, 10, 11, 13, 14, 15, 16 & 17)

- **SDG&E**
  - Base: 4,289 MW
  - Sensitivity: 8,401 MW
  (Policy-driven Projects 13, 14, 15, 16, 17, 18, 19, 20, & 21)
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

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

<table>
<thead>
<tr>
<th>Resource Type (MW)</th>
<th>2023-2024 Transmission Planning Process</th>
<th>20-Year Transmission Outlook</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Portfolio (2035)</td>
<td>OSW Sensitivity (2035)</td>
</tr>
<tr>
<td>Natural Gas Fired Power Plants</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Utility-Scale Solar</td>
<td>38,947</td>
<td>25,746</td>
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<tr>
<td>Distributed Solar</td>
<td>125</td>
<td>125</td>
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<tr>
<td>In-state wind</td>
<td>3,074</td>
<td>3,074</td>
</tr>
<tr>
<td>Offshore wind</td>
<td>5,497</td>
<td>13,400</td>
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<tr>
<td>Out-of-state wind</td>
<td>5,618</td>
<td>5,618</td>
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<tr>
<td>Geothermal</td>
<td>2,037</td>
<td>1,149</td>
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<tr>
<td>Biomass</td>
<td>134</td>
<td>134</td>
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<tr>
<td>Battery-energy storage</td>
<td>28,373</td>
<td>23,545</td>
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<tr>
<td>Long-duration energy storage (pumped storage)</td>
<td>2,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Generic clean firm/long-duration energy storage</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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

- Reliability Driven Projects meeting Reliability Needs
- Policy Driven Projects meeting Policy and possibly Reliability Needs
- Economic Driven Projects meeting Economic and possibly Policy and Reliability Needs (multi-value)

Commitment for biennial _10-year local capacity study

Assess local capacity areas

Subsequent consideration of interregional transmission project proposals as potential solutions to regional needs...as needed.
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.

http://www.caiso.com/planning/Pages/InterregionalTransmissionCoordination/default.aspx
Study Areas

- **Northern Area - Bulk**
  - 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
  
## 2024-2025 TPP, Composition of 2034 base and sensitivity portfolios

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

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This table shows the composition of the base and sensitivity portfolios for 2024-2025 TPP, detailing the capacity contribution of various resource types in MW (megawatts). The columns represent FCDS (First Clear Day System) capacity, followed by EO (Emergency Operating) capacity, and then the total capacity for both the base and sensitivity portfolios.
## 2024-2025 TPP, Composition of 2039 base and sensitivity portfolios

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Base Portfolio</th>
<th>Sensitivity Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FCDS (MW)</td>
<td>EO (MW)</td>
</tr>
<tr>
<td>Biomass</td>
<td>171</td>
<td>0</td>
</tr>
<tr>
<td>Distributed_Solar</td>
<td>283</td>
<td>0</td>
</tr>
<tr>
<td>Geothermal</td>
<td>1,969</td>
<td>0</td>
</tr>
<tr>
<td>LDES</td>
<td>1,080</td>
<td>0</td>
</tr>
<tr>
<td>Li_Battery (4-hour)</td>
<td>15,707</td>
<td>0</td>
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<tr>
<td>Li_Battery (8-hour)</td>
<td>7,115</td>
<td>0</td>
</tr>
<tr>
<td>Offshore Wind</td>
<td>4,531</td>
<td>0</td>
</tr>
<tr>
<td>OOS Wind</td>
<td>9,096</td>
<td>0</td>
</tr>
<tr>
<td>Solar</td>
<td>10,858</td>
<td>19,541</td>
</tr>
<tr>
<td>Wind, Onshore</td>
<td>6,103</td>
<td>921</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>56,912</strong></td>
<td><strong>20,462</strong></td>
</tr>
</tbody>
</table>
2024-2025 TPP, Gas generation retirement assumptions in the portfolios

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Assumed gas retirements (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2034</td>
</tr>
<tr>
<td>Base</td>
<td>7,140</td>
</tr>
<tr>
<td>Sensitivity (High gas retirement scenario)</td>
<td>9,130</td>
</tr>
</tbody>
</table>

- 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

<table>
<thead>
<tr>
<th>State Wind</th>
<th>2022-2023 TPP (2033)</th>
<th>2023-2024 TPP (2035)</th>
<th>2024-2025 TPP (2039)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idaho Wind</td>
<td>Eldorado</td>
<td>1062</td>
<td>1000</td>
</tr>
<tr>
<td>Wyoming Wind</td>
<td>Eldorado</td>
<td>1500</td>
<td>2905</td>
</tr>
<tr>
<td></td>
<td>Tesla</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Mexico Wind</td>
<td>Palo Verde</td>
<td>438</td>
<td>2328</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total OOS Wind</strong></td>
<td>1500</td>
<td>4828</td>
<td>6096</td>
</tr>
</tbody>
</table>

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**

**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.

**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

**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.

**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.

**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

<table>
<thead>
<tr>
<th></th>
<th>2022-2023 TPP</th>
<th>2023-2024 TPP</th>
<th>2024-20253 TPP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Portfolio</td>
<td>Sensitivity Portfolio</td>
<td>Base Portfolio</td>
</tr>
<tr>
<td>Morrow Bay Call Area</td>
<td>1588</td>
<td>3100</td>
<td>3100</td>
</tr>
<tr>
<td>Humboldt Call Area</td>
<td>120</td>
<td>1607</td>
<td>1607</td>
</tr>
<tr>
<td>Del Nort Area</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cape Mendocino Area</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total OSW</td>
<td>1708</td>
<td>4707</td>
<td>4707</td>
</tr>
</tbody>
</table>

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

• 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

20-Year Transmission Outlook (both May 2022 and Update) includes retirement of 15,000 MW of gas-fired generation.
Resources mapped to the transmission zones in the 2045 Transmission Outlook

- **Northern CA Offshore Wind**
  - Total: 14,600 MW

- **PG&E Greater Bay**
  - Total: 6,638 MW

- **PG&E Fresno**
  - Total: 27,697 MW

- **PG&E East Kern**
  - Total: 13,520 MW

- **Morro Bay Offshore Wind**
  - Total: 5,400 MW

- **SCE North of Lugo**
  - Total: 5,994 MW

- **SCE North of Greater Bay**
  - Total: 6,649 MW

- **SCE Northern**
  - Total: 24,286 MW

- **SCE Metro**
  - Total: 2,201 MW

- **SCE Eastern**
  - Total: 18,164 MW

- **SDG&E**
  - Total: 12,266 MW

- **IID**
  - Total: 4,001 MW

- **New Mexico Wind**
  - Total: 5,329 MW

- **Wyoming and/or Idaho Wind**
  - Total: 6,671 MW

- **Morro Bay Offshore Wind**
  - Total: 5,400 MW

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

- **Northern Nevada Geothermal**
  - North of GB: 30 MW
  - East of Pisgah: 405 MW
  - North of Lugo: 13 MW

- **Northern CA Offshore Wind**
  - Total: 14,600 MW

- **PG&E North of Greater Bay**
  - Total: 6,649 MW
Out-of-State Wind – comparison between the 20-Year Transmission Outlook and the ISO’s Transmission Planning Process

<table>
<thead>
<tr>
<th></th>
<th>2022-2023 TPP (2033)</th>
<th>2023-2024 TPP (2035)</th>
<th>2024-2025 TPP (2039)</th>
<th>20-Year Transmission Outlook (2045)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idaho Wind</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Eldorado</td>
<td>1062</td>
<td>1000</td>
<td>1060</td>
<td>1000</td>
</tr>
<tr>
<td>Wyoming Wind</td>
<td></td>
<td></td>
<td></td>
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<td>Tesla</td>
<td></td>
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<td>1500</td>
<td></td>
</tr>
<tr>
<td>TBD</td>
<td></td>
<td></td>
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<td>438</td>
<td>2328</td>
<td>2131</td>
<td>2328</td>
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<tr>
<td>TBD</td>
<td></td>
<td></td>
<td>3536</td>
<td>2882</td>
</tr>
<tr>
<td>Total OOS Wind</td>
<td>1500</td>
<td>4828</td>
<td>6096</td>
<td>11210</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>2022-2023 TPP</th>
<th>2023-2024 TPP</th>
<th>2024-2025 TPP</th>
<th>20-Year Transmission Outlook</th>
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<tbody>
<tr>
<td></td>
<td>Base Portfolio</td>
<td>Sensitivity Portfolio</td>
<td>Base Portfolio</td>
<td>Sensitivity Portfolio</td>
</tr>
<tr>
<td>Morrow Bay Call Area</td>
<td>1588</td>
<td>3100</td>
<td>3100</td>
<td>5355</td>
</tr>
<tr>
<td>Humboldt Call Area</td>
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<td>1607</td>
<td>1607</td>
<td>2600</td>
</tr>
<tr>
<td>Del Nort Area</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3445</td>
</tr>
<tr>
<td>Cape Mendocino Area</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2000</td>
</tr>
<tr>
<td><strong>Total OSW</strong></td>
<td><strong>1708</strong></td>
<td><strong>4707</strong></td>
<td><strong>4707</strong></td>
<td><strong>13400</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Technology</th>
<th>Normal Rating Assumptions (MVA)</th>
<th>Emergency Rating Assumptions (MVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 kV AC line to Fern Road</td>
<td>3,500</td>
<td>4,500</td>
</tr>
<tr>
<td>Onshore overhead VSC-HVDC to Collinsville Substation</td>
<td>3,000</td>
<td>3,500</td>
</tr>
<tr>
<td>Offshore sea cable VSC-HVDC to a Substation in the Bay Area</td>
<td>2,000</td>
<td>2,500</td>
</tr>
</tbody>
</table>

Identify the connection points for the new 500 kV AC lines, the HVDC lines, VSC-HVDC lines and the required reinforcement on the existing transmission system

Offshore wind ~20-30 mi from shore (14,428 MW)

Offshore wind ~30 mi from shore (6,743 MW)
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