

Memorandum

- To: ISO Board of Governors
- From: Neil Millar, Vice President, Transmission Planning and Infrastructure Development

Date: May 14, 2025

Re: Decision on the ISO's 2024-2025 Transmission Plan

This memorandum requires ISO Board of Governors action.

EXECUTIVE SUMMARY

Each year the California ISO produces a transmission plan based on a comprehensive assessment of the transmission needs of the system. While this analysis has typically assessed a 10-year planning horizon, the ISO's 2024-2025 Transmission Plan assesses transmission needs over a 15-year horizon. This is the first time the annual planning process has reached out 15 years, reflecting state legislative requests to consider the longer timeframe. This plan provides a comprehensive evaluation of the ISO's transmission grid to identify upgrades needed to successfully meet California's policy goals, and examines conventional grid reliability requirements and transmission projects that can bring economic benefits to consumers. Management thus seeks the ISO Board of Governors' approval of the ISO's 2024-2025 Transmission Plan, included as Attachment A.

This year's transmission plan is based on state projections provided to the ISO in 2024 that California needs to add more than 76 GW of capacity¹ by 2039. This capacity requirement is consistent with the base portfolio amounts that were the basis of last year's 2023-2024 Transmission Plan. This reflects greenhouse gas reduction goals and load growth. It also includes the potential for increased electrification occurring in other sectors of the economy, most notably in transportation and the building industry. An increase in the year-over-year rate of peak demand growth, and in particular, a change in the Greater Bay area, is driving transmission needs to supply the loads. The forecast in the Greater Bay area represents an

¹ The California Public Utilities Commission provided portfolio calls for 76 GW of installed capacity, beyond its baseline of existing resources and resources already contracted for and under development.



increase in the 2035 peak load forecast of over 2,000 MW from the previous planning cycle.

The proactive and coordinated strategic direction reflected in this year's transmission plan continues to align with the joint Memorandum of Understanding signed in December 2022, by the California Public Utilities Commission (CPUC), California Energy Commission (CEC), and the California ISO. The Memorandum of Understanding tightens the linkages between resource and transmission planning activities, interconnection processes and resource procurement so California is better equipped to meet its reliability needs and clean-energy policy objectives required by Senate Bill 100.

In the 2024-2025 Transmission Plan, reliability projects driven by load growth and evolving grid conditions represent 28 projects with an estimated cost of \$4.6 billion. The projects are required to reliably supply the increase in forecasted load related to electrification and electric vehicle transportation loads.

The ISO found the need for three transmission projects that are policy-driven with an estimated cost of \$289.5 million. They are needed to meet the renewable generation requirements established in the CPUC-developed renewable generation portfolios, which reflected modest changes from last year's plan.

Each year the ISO studies and monitors expected levels of congestion on the transmission system through detailed production cost modeling, and prioritizes study areas to assess if the benefits of alleviating that congestion exceed the cost of additional transmission upgrades. This also takes into account other potential economic benefits of possible transmission upgrades. Accordingly, the ISO conducted several economic studies in this planning cycle investigating opportunities to reduce total costs to ratepayers through transmission upgrades not otherwise needed for reliably accessing renewables and serving load. No projects driven solely by economic considerations are being recommended in this plan.

Other key features and conclusions from the 2024-2025 Transmission Plan are below:

- This 2024-2025 transmission planning process is the first complete planning cycle in which the CPUC and CEC developed and submitted 15-year demand forecasts and portfolios to the ISO for transmission planning, rather than 10-year, as required under Senate Bill 887 (Becker, 2022).
- The ISO considered all interregional transmission project proposals in this planning cycle and did not identify an ISO need for the interregional transmission project proposals submitted by stakeholders.



• In this plan, five reconductoring projects include the use of advanced conductors, which is a form of grid-enhancing technology.

This transmission plan was developed after extensive stakeholder engagement. We communicated preliminary results through stakeholder presentations on September 23 and 24, and on November 13, 2024. The ISO released a draft plan on March 31, 2025, and presented it to stakeholders on April 15, 2025. Based on stakeholder comments, we conducted additional review and made further revisions, culminating in the revised ISO 2024-2025 Transmission Plan.

Management proposes the following motion:

Moved, that the ISO Board of Governors approves the ISO's 2024-2025 Transmission Plan attached to the memorandum dated May 14, 2025.

BACKGROUND

A core responsibility of the ISO is to plan and approve additions and upgrades to transmission infrastructure so that as conditions and requirements evolve over time, we can continue to provide a well-functioning wholesale power market through reliable, safe and efficient electric transmission service. The ISO fulfils this responsibility through its annual transmission planning process.

Board approval of the transmission plan is required. Tariff section 24.4.10 states that upon approval of the plan, all needed transmission additions and upgrade projects and elements will be deemed approved by the ISO Board of Governors.

As set out in the Memorandum of Understanding, expectations are that the CPUC will continue to provide resource planning information to the ISO as it did for this transmission planning cycle. The ISO will develop a final transmission plan, initiate the transmission projects and communicate to the electricity industry specific geographic zones that are being targeted for transmission projects along with the capacity being made available in those zones. The CPUC and local regulatory authorities will in turn provide clear direction to load-serving entities to focus their energy procurement in those key transmission zones, in alignment with the transmission plan. To bring this more coordinated approach full circle, the ISO will also give priority to interconnection requests located within those same zones in its generation interconnection process.





This year's transmission plan is based on state projections² provided to the ISO in 2024 that California needs to add more than 76 gigawatts (GW) of new capacity³ by 2039.⁴ As in the past, the ISO has continued to explore with stakeholders cost-effective solutions to meeting long term needs and will continue to do so in the future.

² In planning for the new resources required to meet system-wide resource needs, CPUC portfolios also took into account the announced retirements of approximately 3700 MW of gas-fired generation to comply with state requirements for thermal generation relying on coastal w ater for once-through cooling, and the planned retirement of the Diablo Canyon Pow er Plant. The ISO is not relying on the gas fired generation or Diablo Canyon Pow er Plant to meet any local capacity or grid support purposes beyond the planned retirement dates. How ever, the ISO must continue to ensure that they are reliably interconnected and can continue to operate through any potential extension period, so the resources are modeled in the ISO's studies for those purposes only.

³ The CPUC-provided portfolio calls for 76 GW of installed capacity, beyond its baseline of existing resources and resources already contracted for and under development.

⁴ Senate Bill 887, The Accelerating Renewable Energy Delivery Act (Becker, 2022) provides state policy direction on a number of resource and transmission planning issues, including direction about requests the CPUC is to make of the ISO in conducting its FERC tariff-based planning processes, and the submission of 15 year forecasts and portfolios by the CEC and CPUC for consideration in this year' planning process.



KEY FINDINGS

Our comprehensive evaluation of the areas listed above is discussed in the following sections.

Reliability-driven transmission projects

Reliability projects driven by load growth and evolving grid conditions as the generation fleet transitions to increased renewable generation represent 28 projects with an estimated cost of \$4.6 billion. In arriving at these projects, the ISO and transmission owners performed power system studies to measure system performance against the NERC reliability standards and ISO planning standards, as well as to identify reliability concerns that included, among other things, facility overloads and voltage excursions. The ISO then evaluated mitigation measures and identified cost-effective solutions. The reliability assessment also identified one previously-approved project to be on hold pending reassessment in future cycles.

Policy-driven transmission projects (transmission elements supporting renewable energy goals)

The CPUC issued Decision 23-02-040⁵ on February 28, 2023, adopting a base and a sensitivity portfolio for use in the 2024-2025 transmission planning process. The portfolios are based on the 30-million metric ton greenhouse gas target by 2030 and the 2022 Integrated Energy Policy Report demand forecast. The resource portfolios were relatively consistent with those provided for the 2023-2024 transmission planning process.

The ISO found the need for three policy-driven transmission projects with an estimated cost of \$289.5 million to meet the renewable generation requirements established in the CPUC developed renewable generation portfolios.

Economically-driven transmission projects

The objective of the ISO's economic studies is to identify transmission congestion and analyze if the congestion can be cost-effectively mitigated by network upgrades. Generally speaking, transmission congestion increases consumer costs because it prevents lowerpriced electricity from serving load. Resolving congestion bottlenecks is cost-effective when projected ratepayer savings are greater than the cost of the project. In such cases, the transmission upgrade can be justified as an economic project. Further, the ISO also reviews other economic benefits in lowering overall costs to ratepayers, including the

⁵https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M502/K956/502956567.PDF



reduction of local capacity costs, as a consideration in assessing the benefits of potential transmission upgrades.

The ISO conducted several economic studies investigating opportunities to reduce total costs to ratepayers through transmission upgrades not otherwise needed for reliably accessing renewables and serving load. No projects driven solely by economic considerations are being recommended in this plan.

Interregional Transmission Coordination Process

The ISO is required to coordinate its examination of potential interregional projects submitted by stakeholders into the ISO's process and the processes of the ISO's neighboring planning entities in the western interconnection - WestConnect and NorthernGrid. The ISO considered all interregional transmission project proposals in its 2024-2025 transmission planning process and did not identify an ISO need for the proposed interregional transmission projects.

Informational Studies

As in past transmission planning cycles, the ISO undertook additional technical studies to help inform future transmission or resource planning activities. These are informational only but may be of interest to stakeholders. They include sensitivity studies suggested by the CPUC, frequency response analysis and examination of viability of congestion revenue rights.

The CPUC resource portfolios included a sensitivity scenario that was based on elevated levels of retirement of gas-fired generation. In addition to reliability, policy and economic analysis, the ISO also assessed the sensitivity scenario in the long-term local capacity technical analysis.⁶ The following observations were made:

- The reliability constraints and resource deficiencies increased in the Greater Bay area;
- The local capacity requirements increased in the 15-year planning horizon in the LA Basin. With increased storage resources in the portfolio in the LA Basin area, the constraint can be addressed with local dynamic voltage support; and
- Thermal constraints were observed in the 15-year planning horizon in the Moorpark area.

⁶ The detailed analysis is included in the applicable Appendices B, F, G and J of the plan.



Grid-Enhancing Technologies

Grid-enhancing technologies are a group of technologies with specific benefits and opportunities that the ISO considers on a case-by-case basis. The ISO has considered several of them – advanced conductors and flow control devices – as potential alternatives in the annual transmission planning process for many years. In this plan, the following projects will rely on advanced conductors:

- Metcalf-Piercy & Swift and Newark-Dixon Landing 115 kV Upgrade:
 - Piercy-Metcalf 115 kV line;
 - Swift-Metcalf 115 kV line;
 - Newark-Dixon Landing 115 kV line; and
 - McKee-Piercy 115 kV line;
- Julian Hinds-Mirage 230 kV Advanced Reconductor

Advancing preferred resources

The ISO's transmission planning efforts focus not only on reliability and meeting the state's policy objectives through advancing policy-driven transmission, but also on transitioning to a cleaner, lower-emission future. This includes consideration of preferred resources, particularly storage, to meet transmission needs.

The ISO's assessment of preferred resources to address specific reliability needs is described throughout the documentation provided in Appendix B of the attached revised draft transmission plan. While no new applications of preferred resources to meet transmission needs were identified in this year's transmission planning cycle, the ISO has summarized in section 8.4 the current reliance on preferred resources resulting from past transmission plans.

These include:

- Grid-connected and behind the meter preferred resources in the L.A. Basin and San Diego local capacity areas, along with the contribution of certain existing demand response resources within the Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E) areas.
- The Oakland Clean Energy Initiative and associated required transmission upgrades to reduce reliance on local thermal generation in the Oakland sub-area.
- SCE's preferred resource procurement (primarily energy storage) to enable retirement of the Mandalay Generating Station and Ormond Beach Generating Station in compliance with state once-through cooling policies.



The ISO is also continuing to work with local utilities to fine-tune preferred resource requirements identified in earlier transmission plans, including battery storage, which in conjunction with conventional transmission upgrades will meet reliability needs in several areas.

Finally, the plan has recommended that one previously approved project currently on hold remain on hold pending further review.

STAKEHOLDER FEEDBACK

Stakeholders have provided feedback on the Draft ISO 2024-2025 Transmission Plan that was released on March 31, 2025, and presented at a stakeholder meeting on April 15, 2025. The ISO has reviewed all of the stakeholder comments carefully, and has concluded that the recommendations made in the 2024-2025 Transmission Plan are appropriate. Stakeholders generally provided complimentary and supportive feedback on the transmission plan itself. The more significant stakeholder concerns, and our response to those concerns, are summarized below.

- Concerns with assessment of alternative submitted into the request window. Hetch Hetchy Water and Power submitted the Warnerville-Newark Transmission Expansion Project into the request window to address reliability needs identified in the Greater Bay area. Hetch Hetchy Water and Power indicate from their analysis the ISO should recommend for approval the Warnerville-Newark Transmission Expansion Project in conjunction with the Greater Bay area 500 kV transmission reinforcement.
 - The ISO assessed the Warnerville-Newark Transmission Expansion Project as an alternative to mitigate the reliability needs in the Greater Bay area; however, it was not selected as a part of the mitigation plan to address the ISO's identified needs in this planning cycle. Based on the CEC load forecast for the 2025-2026 transmission planning process, there is continued significant load growth identified in the Greater Bay area.
 - The ISO will continue to assess the Warnerville-Newark Transmission Expansion Project in discussion with Hetch Hetchy Water and Power as a potential extension of the 2024-2025 planning cycle.
- Concerns with transparency of transmission plan deliverability reservations for long lead-time resources: Large Scale Solar Association, Northern California Power Agency and Pacific Gas and Electric expressed concerns regarding the explanation and transparency of the transmission plan deliverability reservations identified in the plan for long lead-time generation and storage resources.



- The ISO has identified the long lead-time resources consistent with the approach included in the ISO's interconnection process enhancements track three initiative in the draft plan presented to stakeholders. The ISO has added additional information into the revised plan to provide additional information and clarity on the transmission plan deliverability reservations for long leadtime resources.
- Concerns with assessment of grid enhancing technologies: The Working for Advanced Transmission Technologies (WATT) Coalition and California Public Utilities Commission - Public Advocates Office indicated that a more detailed assessment of grid enhancing technologies should be included in the alternative analysis, particularly the consideration of dynamic line rating in the planning assessments.
 - As with past planning cycles, where the ISO has recommended the need for flow control devices and advanced conductors, the ISO continues to assess grid-enhancing technologies as potential alternatives to meet the identified needs in the planning assessment. In this year's plan, the ISO has recommended five reconductoring projects using advanced conductors.
 - Dynamic line ratings are based on the specific environmental and operating conditions in real-time. In the planning horizon, the ISO uses static seasonal line ratings to reflect anticipated transmission capacity during forecast stressed conditions on the system. The ISO also notes that the incorporation of ambient adjusted ratings into grid operations pursuant to FERC Order No. 881 may provide economic benefit in reducing congestion during other less stressed system conditions. The ISO expects to explore future economic benefit opportunities for dynamic line rating applications after FERC Order No. 881 has been implemented.

CONCLUSION

The ISO's 2024-2025 Transmission Plan provides a comprehensive evaluation of the ISO's transmission grid to identify upgrades needed to adequately meet California's policy goals, address grid reliability requirements and bring economic benefits to consumers. The combination of continued projections of renewable generation and load forecast growth are driving an increase in transmission requirements. The ISO found the need for 31 projects with an estimated cost of \$4.8 billion. The projects developed in this year's planning cycle represent a transition to higher rates of load growth anticipated in next year's transmission



planning process, providing reliability, access to renewable generation needed to meet state goals, and effective economic benefits into the future.

Based on the findings that the transmission solutions listed above are the most costeffective, feasible solutions for meeting the identified transmission needs in the ISO's system, Management recommends that the ISO Board of Governors approves the attached ISO 2024-2025 Transmission Plan.