

Memorandum

To: ISO Board of Governors

From: Neil Millar, Vice President of Infrastructure and Operations Planning

Date: May 15, 2024

Re: Decision on the ISO's 2023-2024 transmission plan

This memorandum requires ISO Board of Governors action.

EXECUTIVE SUMMARY

Each year the California Independent System Operator Corporation undertakes a comprehensive assessment of the transmission needs of the system over a 10-year planning horizon and produces an annual transmission plan. The ISO's 2023-2024 transmission plan provides a comprehensive evaluation of the ISO's transmission grid to identify upgrades needed to successfully meet California's policy goals, in addition to examining conventional grid reliability requirements and transmission projects that can bring economic benefits to consumers. As per the ISO tariff, Management seeks the ISO Board of Governors' approval of the ISO transmission plan for the 2023-2024 planning cycle, included as Attachment A.

The need for additional generation of electricity over the next 10 years has escalated rapidly in California as it continues transitioning to the carbon-free electrical grid required by the state's clean-energy policies. This in turn has been driving a dramatically accelerated pace for new transmission development in current and future planning cycles – as much as 7,000 MW/year of new resources over the next decade to achieve the state projections to add more than 85 gigawatts (GW) of new capacity¹ by 2035. To help ensure we have the transmission in place to achieve this transition reliably and cost-effectively, the ISO's 2023-2024 transmission plan reflects a much more strategic and proactive approach to better synchronize power and transmission planning, interconnection queuing and resource procurement and is put forward in close coordination with the state's primary energy

¹ The CPUC-provided portfolio calls for 85 GW of installed capacity, beyond its baseline of existing resources and resources already contracted for and under development.

planning and regulatory entities, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC).

The proactive and coordinated strategic direction reflected in this year's transmission plan continues to embrace the joint Memorandum of Understanding (MOU) signed by the three parties in December 2022. The MOU 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.

As set out in the MOU, 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 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.²

The combination of dramatically increasing the pace of renewable generation and load forecast growth are driving an increase in transmission requirements. The ISO found the need for 26 projects totaling \$6.1 billion. The projects recommended in this plan make all of the base amounts available and, in particular, provides access to offshore wind in the Humboldt call area in Northern California.

Reliability projects driven by load growth and evolving grid conditions as the generation fleet transitions to increased renewable generation represent 19 projects totaling \$1.54 billion. The projects are required to reliably supply the increase in forecasted load related to electrification and electric vehicle transportation loads.

² Commencing in 2023, the ISO has been conducting a stakeholder process to enhance its interconnection process, driving transformational changes to better enable rapid deployment of new generation for reliability, affordability, and decarbonization. Through a robust stakeholder process and considering the urgent need to bring historic amounts of new capacity online as quickly and as efficiently as possible, the ISO has developed reforms that emphasize up-front project readiness and alignment with local and state resource and transmission planning efforts. A comprehensive briefing on the initiative and its final proposal is being provided at the May 2024 Board of Governors meeting.

The ISO found the need for seven policy-driven transmission projects totaling \$4.53 billion to meet the renewable generation requirements established in the CPUC-developed renewable generation portfolios. The ISO also continues working to refine its recommendation regarding three reliability-driven projects. This work will be conducted as an extension of the 2023-2024 transmission plan, with ISO Board of Governors approval anticipated to be sought in Q2 or Q3 of this year.

The ISO conducted several economic studies investigating opportunities to reduce total costs to ratepayers through transmission upgrades not otherwise needed for reliability or meeting policy objectives. No projects driven solely by economic considerations are being recommended in this plan.

Other key findings and conclusions from the 2023-2024 transmission plan include:

- **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. The ISO has considered the state policy direction provided by SB 887 in the development of this transmission plan and also conducted a review of high-priority transmission projects as requested by the CPUC for this planning cycle.
- **FERC Order No. 1000 Interregional 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 (ITP) proposals in its 2022-2023 transmission planning process and did not identify an ISO need for the proposed ITPs. Consistent with the Order No. 1000 Common Interregional Tariff, the ISO was not required to consider the proposed ITPs beyond the ISO's 2022-2023 transmission planning process. Commensurate with this outcome, no further consideration of the submitted ITPs was required in the 2023-2024 transmission planning process.
- **Grid-Enhancing Technologies (GETs):** GETs encompasses a range of technologies with specific benefits and opportunities that have to be considered on a case-by-case basis and the ISO supports appropriate application and deployment of these technologies. The ISO has also considered several of them – advanced conductors and flow control devices - as potential alternatives in the annual transmission planning process for many years, with particular success in selecting flow controllers in a number of cases in past plans and approving for the first time a policy-driven project specifically employing advanced conductors in the 2022-2023 Transmission Plan. In this plan, a phase-shifting transformer that provides flow control is recommended for approval to

increase the resiliency in the Humboldt area. The ISO will continue to explore opportunities for GETS in future planning processes.

This transmission plan was developed after extensive stakeholder engagement. We communicated preliminary results through stakeholder presentations on September 26 and 27, and on November 16, 2023. The ISO released a draft plan on April 1, 2024, and presented it to stakeholders on April 9, 2024. Based on stakeholder comments received, we conducted additional review and made further revisions, culminating in the revised draft ISO 2023-2024 transmission plan.

Management proposes the following motion:

Moved, that the ISO Board of Governors approves the ISO 2023-2024 transmission plan attached to the memorandum dated May 15, 2024.

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. Since it began operation in 1998, the ISO has fulfilled this responsibility through its annual transmission planning process.

Board approval of the transmission plan is required. Specifically, section 24.4.10 of the tariff states:

The revised draft comprehensive Transmission Plan, along with the stakeholder comments, will be presented to the CAISO Governing Board for consideration and approval. Upon approval of the plan, all needed transmission addition and upgrade projects and elements, net of all transmission and non-transmission alternatives considered in developing the comprehensive Transmission Plan, will be deemed approved by the CAISO Governing Board. Transmission upgrade and addition projects with capital costs of \$50 million or less can be approved by CAISO management and may proceed to permitting and construction prior to Governing Board approval of the plan. Following Governing Board approval, the CAISO will post the final comprehensive Transmission Plan to the CAISO website.

Collaborative planning efforts

To help ensure we have the transmission in place to achieve this transition reliably and cost-effectively, the ISO's 2023-2024 transmission plan reflects a much more strategic and

proactive approach to better synchronize power and transmission planning, interconnection queuing and resource procurement, and is put forward in close coordination with the state's primary energy planning and regulatory entities, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC).

The more proactive and coordinated strategic direction reflected in this year's transmission plan is set forth in a joint Memorandum of Understanding (MOU)³ signed by the three parties in December 2022. The MOU 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 100.⁴

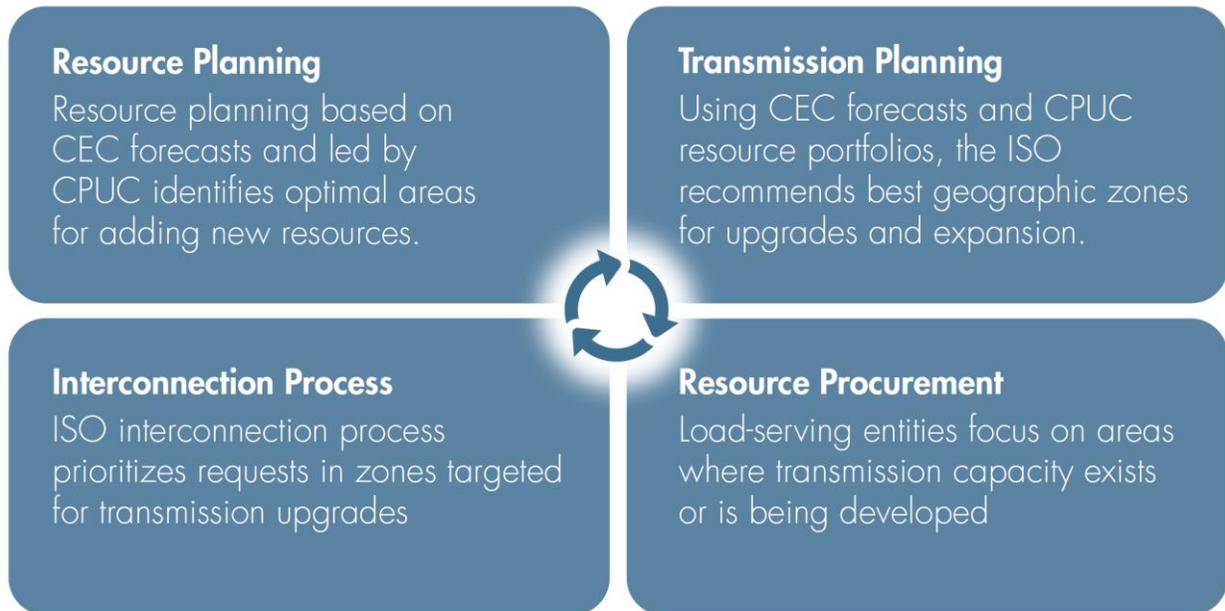
As set out in the MOU, expectations are that the CPUC⁵ will continue to provide resource planning information to the ISO as it did for this transmission planning cycle. The ISO will develop a final transmission plan, initiate the transmission projects and communicate to the electricity industry specific geographic zones that are being targeted for transmission projects along with the capacity being made available in those zones. The CPUC 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.

³ <http://www.caiso.com/Documents/ISO-CEC-and-CPUC-Memorandum-of-Understanding-Dec-2022.pdf>

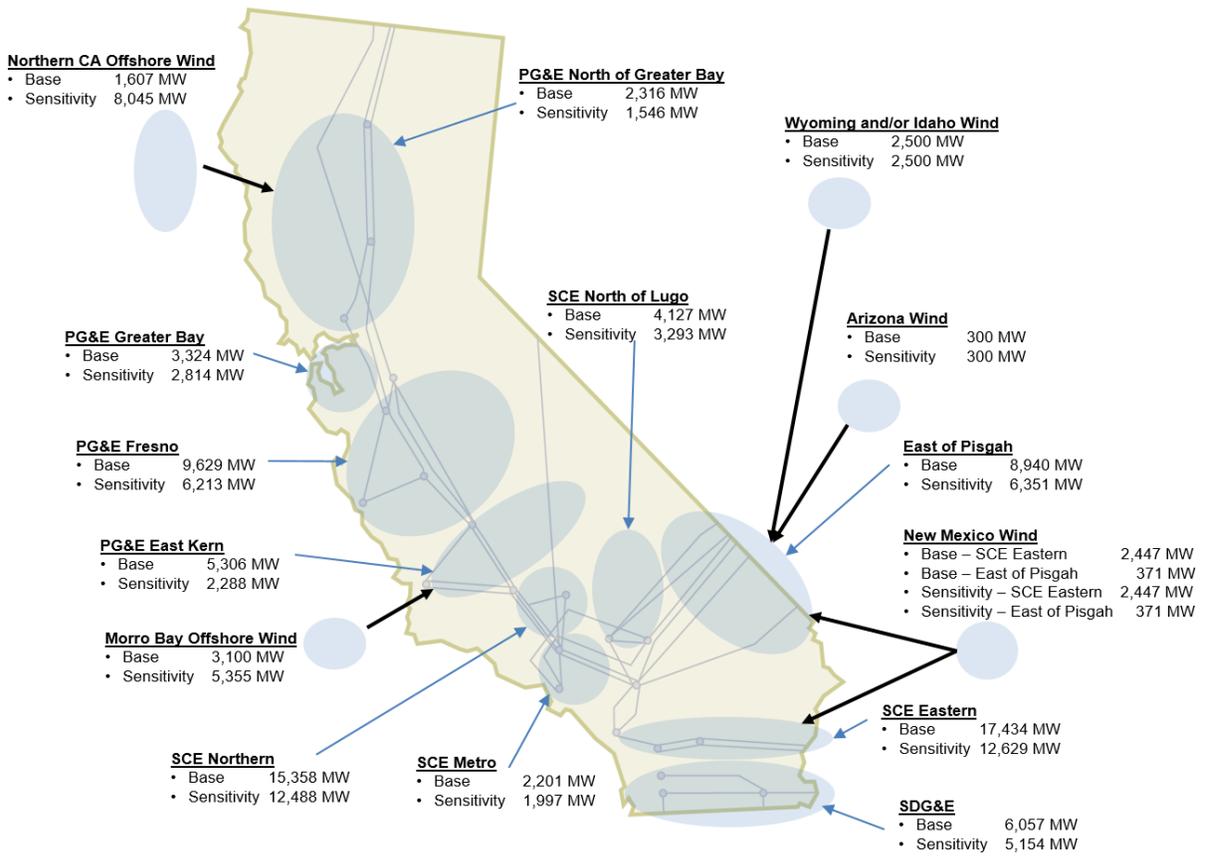
⁴ SB 100, the 100% Clean Energy Act of 2018, authored by Senator Kevin De León, was signed into law by Governor Jerry Brown on September 10, 2018. Among other provisions, SB 100 built on existing legislation including SB 350 and revised the previously established goals to achieve the 50% renewable resources target by December 31, 2026, and to achieve a 60% target by December 31, 2030. The bill also set out the state policy that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045.

https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100

⁵ In addition to the needs of the jurisdictional load serving entities in the ISO's footprint, the CPUC currently works to include the needs of the publicly owned utilities and other non-CPUC-jurisdictional utilities in its resource planning efforts for the ISO balancing authority area, and this is an issue that will be receiving additional attention in future planning cycles to ensure the needs of these parties are being addressed.



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 projections⁶ provided to the ISO in 2023 that California needs to add more than 85 gigawatts (GW) of new capacity⁷ by 2035.

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.

Grid-Enhancing Technologies (GETs)

GETs encompasses a range of technologies with specific benefits and opportunities that have to be considered on a case-by-case basis and the ISO supports appropriate application and deployment of these technologies. The ISO has also considered several of them – advanced conductors and flow control devices - as potential alternatives in the annual transmission planning process for many years, with particular success in selecting flow controllers in a number of cases in past plans and approving for the first time a policy-driven project specifically employing advanced conductors in the 2022-2023 Transmission Plan. In this plan, a phase-shifting transformer that provides flow control is recommended for approval to increase the resiliency in the Humboldt area. The ISO will continue to explore opportunities for GETS in future planning processes.

Advancing preferred resources

The ISO's transmission planning efforts focus on not only reliability and on meeting the state's policy objectives through advancing policy-driven transmission, but also on helping transform the electric grid in an environmentally responsible way. The focus on a cleaner, lower-emission future governs not only policy-driven transmission, but also our path for meeting other electric system needs. Of course, opportunities are based on the identified needs.

Further, preferred resource assumptions are also incorporated into the load forecasts adopted through state energy agency activities that the ISO supports, and provide an additional opportunity for preferred resources to address transmission needs.

⁶ 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 water for once-through cooling, and the planned retirement of the Diablo Canyon Power Plant. The ISO is not relying on the gas fired generation or Diablo Canyon Power Plant to meet any local capacity or grid support purposes beyond the planned retirement dates. However, 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.

⁷ The CPUC-provided portfolio calls for 85 GW of installed capacity, beyond its baseline of existing resources and resources already contracted for and under development.

The ISO's assessment of preferred resources to address specific reliability needs has been undertaken within each of the planning area assessments, in Appendix B, and is summarized in section 8.3 of the transmission plan. 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 – Moorpark and Oakland in particular.

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 19 projects totaling \$1.54 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.

The ISO also continues working to refine its recommendation regarding the following three reliability-driven projects:

- Oakland Area Reinforcement project;
- Short Circuit Mitigation for Imperial Valley 230 kV Circuit Breakers; and
- Short Circuit Mitigation for Miguel 230 kV Circuit Breakers.

This work will be conducted as an extension of the 2023-2024 transmission plan, with ISO Board of Governors approval anticipated to be sought in Q2 or Q3 of this year.

Transmission elements supporting renewable energy goals

The CPUC issued Decision 23-02-040⁸ on February 28, 2023, adopting a base and a sensitivity portfolio for use in the 2023-2024 Transmission Planning Process (TPP). The portfolios are based on the 30-million metric ton (MMT) greenhouse gas (GHG) target by 2030 and the 2021 Integrated Energy Policy Report demand forecast utilizing the additional transportation electrification (ATE) scenario.

The ISO found the need for seven policy-driven transmission projects totaling \$4.59 billion to meet the renewable generation requirements established in the CPUC developed renewable generation portfolios. The majority of the policy-driven projects are to access offshore wind in the Humboldt area identified in the CPUC's base portfolio this year.

Economically-driven (market efficiency) 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 lower-priced 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's tariff and Transmission Economic Assessment Methodology enables review of other economic benefits, including the reduction of local capacity costs, as a consideration in assessing the benefits of potential transmission upgrades.

In the economic planning analysis performed as part of this transmission planning cycle in accordance with the unified planning assumptions and study plan, approved reliability and policy network upgrades and those recommended for approval in this plan were modeled in the economic planning database. This ensured that the results of the analysis would be based on a transmission configuration consistent with the reliability and public policy results documented in this year's transmission plan.

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.

⁸<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M502/K956/502956567.PDF>

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 (ITP) proposals in its 2022-2023 transmission planning process and did not identify an ISO need for the proposed ITPs. Consistent with the Order No. 1000 Common Interregional Tariff, the ISO was not required to consider the proposed ITPs beyond the ISO's 2022-2023 transmission planning process. Commensurate with this outcome, no further consideration of the submitted ITPs was required in the 2023-2024 transmission planning process.

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 frequency response analysis and examination of viability of congestion revenue rights

STAKEHOLDER FEEDBACK

Stakeholders have provided feedback on the draft ISO 2023-2024 transmission plan that was released on April 3, 2024, and presented at a stakeholder meeting on April 9, 2024. The ISO has reviewed all of the stakeholder comments carefully, and has concluded that the recommendations made in the transmission plan are appropriate. The more significant stakeholder concerns, and our response to those concerns, are summarized below.

- **General support for the transmission plan** – Stakeholders generally provided complimentary feedback on the transmission plan itself.

ISO response: The ISO appreciated the positive feedback, has reviewed all of the stakeholder comments carefully, and has concluded that the recommendations made in the transmission plan are appropriate.

- **Concerns with three of the recommended reliability-driven projects** – A few stakeholders identified concerns with advancing projects where the submissions in the request window by PG&E were conceptual in nature and indicated that further analysis should be conducted in the next planning cycle.

ISO response: While the request window submission submitted in the request window was conceptual, the ISO continued to work on the mitigation solutions, in conjunction with PG&E, to address the reliability constraints that were identified and presented to stakeholders in the ISO's reliability assessment.

- **Uncertainty of floating offshore wind** – There was concern expressed by a number of stakeholders related to the uncertainty of floating offshore wind and concerns with the potential of stranded assets with the recommended policy-driven transmission to access the offshore wind in the Humboldt area.

ISO response: The ISO appreciates the concern. The offshore wind resources are included in the base portfolio that are driving the need for the recommended transmission. There are also significant activities being undertaken by the state and federal governments (port development, supply chain and labor development) to advance floating offshore wind to come in-service by 2035 in the Humboldt area. The ISO will continue to monitor the offshore wind development uncertainty and the timing of significant expenditures after the award to a project sponsor through the competitive solicitation process.

CONCLUSION

The ISO 2023-2024 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 a dramatically increased pace of renewable generation and load forecast growth are driving an increase in transmission requirements. The ISO found the need for 26 projects totaling \$6.1 billion. The projects developed in this year's planning cycle represent a transition to expected additional growth in requirements 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. Further, the plan has recommended that one previously approved project currently on hold to remain on hold pending further review.

Based on the findings that the transmission solutions listed above are the most cost-effective, feasible solutions for meeting the identified transmission needs in the ISO's system, Management recommends that the ISO Board of Governors approve the attached ISO 2023-2024 transmission plan.

The ISO also continues working to refine its recommendation regarding the following three reliability-driven projects:

- Oakland Area Reinforcement project;
- Short Circuit Mitigation for Imperial Valley 230 kV Circuit Breakers; and
- Short Circuit Mitigation for Miguel 230 kV Circuit Breakers.

This work will be conducted as an extension of the 2023-2024 transmission plan, with ISO Board of Governors approval anticipated to be sought in Q2 or Q3 of this year.