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ALJ: Elaine C. Lau

Exhibit No.: SEIA-03

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CROSS-EXAMINATION EXHIBIT

2022-2023 CAISO Transmission Plan – Executive Summary



2022-2023 TRANSMISSION PLAN



BOARD APPROVED
May 18, 2023

Executive Summary

The California Independent System Operator (ISO) has prepared this 2022-2023 Transmission Plan as part of its core responsibility to identify and plan the development of solutions to comprehensively meet the future needs of the ISO-controlled transmission grid. The plan was prepared through the annual transmission planning process (TPP) that culminates in an ISO Board of Governors (Board) approved, comprehensive transmission plan.

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. To help ensure we have the transmission in place to achieve this transition reliably and cost-effectively, the ISO's 2022-2023 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)¹ 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 100.²

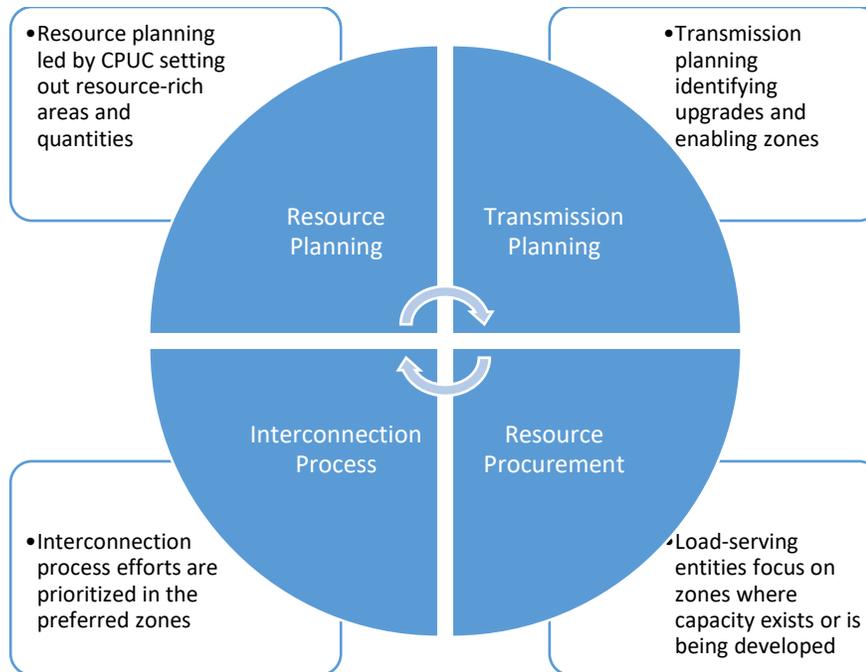
As set out in the MOU, expectations are that the CPUC³ will continue to provide resource planning information to the ISO as it did for this transmission planning cycle. The ISO will develop a final transmission plan, initiate the transmission projects and communicate to the electricity industry specific 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.

¹ <http://www.caiso.com/Documents/ISO-CEC-and-CPUC-Memorandum-of-Understanding-Dec-2022.pdf>

² 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

³ 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.



This year's transmission plan is based on state projections⁴ provided to the ISO in 2022 that California needs to add more than 40 gigawatts (GW) of new resources over the next 10 years, and a sensitivity⁵ study projection calling for 70 GW by 2032 reflecting the potential for increased electrification⁶ occurring in other sectors of the economy, most notably in transportation and the building industry. The CPUC has recently established that next year's transmission plan is to be based on this projection of 70 GW by 2033.

This plan, and the projects described on the following page, enable critical resource development, including:

⁴ 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.

⁵ Each year, the CPUC provides a base resource portfolio, that the ISO is expected to use in determining the need for new transmission projects. As well, the CPUC typically provides one or more sensitivity portfolios with higher or different levels of resource development that the ISO studies to develop transmission capacity and cost information that the CPUC uses in the next annual cycle of resource portfolio development. The sensitivity case, on its own, does not provide a basis for the ISO to approve a new transmission project. However, the ISO can consider the sensitivity case in selecting the preferred alternative to meet a need identified in the base studies.

⁶ The CEC adopted the 2021 IEPR Energy Demand Forecast, 2021-2035 on January 26, 2022 [<https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2021-integrated-energy-policy-report/2021-11>]. The CEC subsequently adopted 2021 IEPR Additional Transportation Electrification Scenario that on July 1, 2022, the CEC and CPUC requested the ISO utilize in the 2022-2023 Transmission Plan. [<http://www.aiso.com/InitiativeDocuments/2022-2023TransmissionPlanningProcess-PortfolioTransmittalLetter.pdf>]

- Over 17 GW of solar generation distributed across the state in solar development regions that include the Westlands area in the Central Valley, Tehachapi, the Kramer area in San Bernardino County, Riverside County, and also in southern Nevada and western Arizona;
- Over 3.5 GW of in-state wind generation in existing wind development regions, including Tehachapi;
- Over 1 GW of geothermal development, primarily in the Imperial Valley and in southern Nevada;
- Access for battery storage projects co-located across the state with renewable generation projects, as well as stand-alone storage located closer to major load centers in the LA Basin, greater Bay Area, and San Diego;
- The import of over 4.5 GW of out-of-state wind generation from Idaho, Wyoming and New Mexico, by enhancing corridors from the ISO border in southeastern Nevada and from western Arizona into California load centers; and
- Up to 3 GW of central coast offshore wind generation prior to the retirement of the Diablo Canyon Power Plant, and up to 5 GW after the retirement.

To achieve these outcomes, the ISO has found the need for a total of 45 transmission projects, the vast majority of which would be built in California. They range in projected costs from \$4 million to \$2.3 billion, for a total infrastructure investment of an estimated \$7.3 billion.⁷ The comprehensive analysis included screening of hundreds of options and detailed assessments of over 60 alternatives in addition to the recommended projects. The alternative analysis considered transmission upgrades, preferred resources (such as storage) and remedial action schemes. The recommended projects include, most notably:

- A new 500 kV transmission line running west from the Arizona border into southern Imperial County, new 500 kV transmission lines angling up from southern Imperial County to northern San Diego and extending into the southern LA Basin, and upgrades to the existing 500 kV and 230 kV lines along the Interstate 10 (I-10) corridor. Together, these upgrades provide access to east Riverside County, Imperial County and Arizona solar generation, Imperial Valley geothermal, and New Mexico wind generation;
- Upgrades to the Lugo–Victor–Kramer 230 kV transmission system to access north of Lugo solar resources; and
- A host of smaller upgrades improving access to other smaller resource zones.

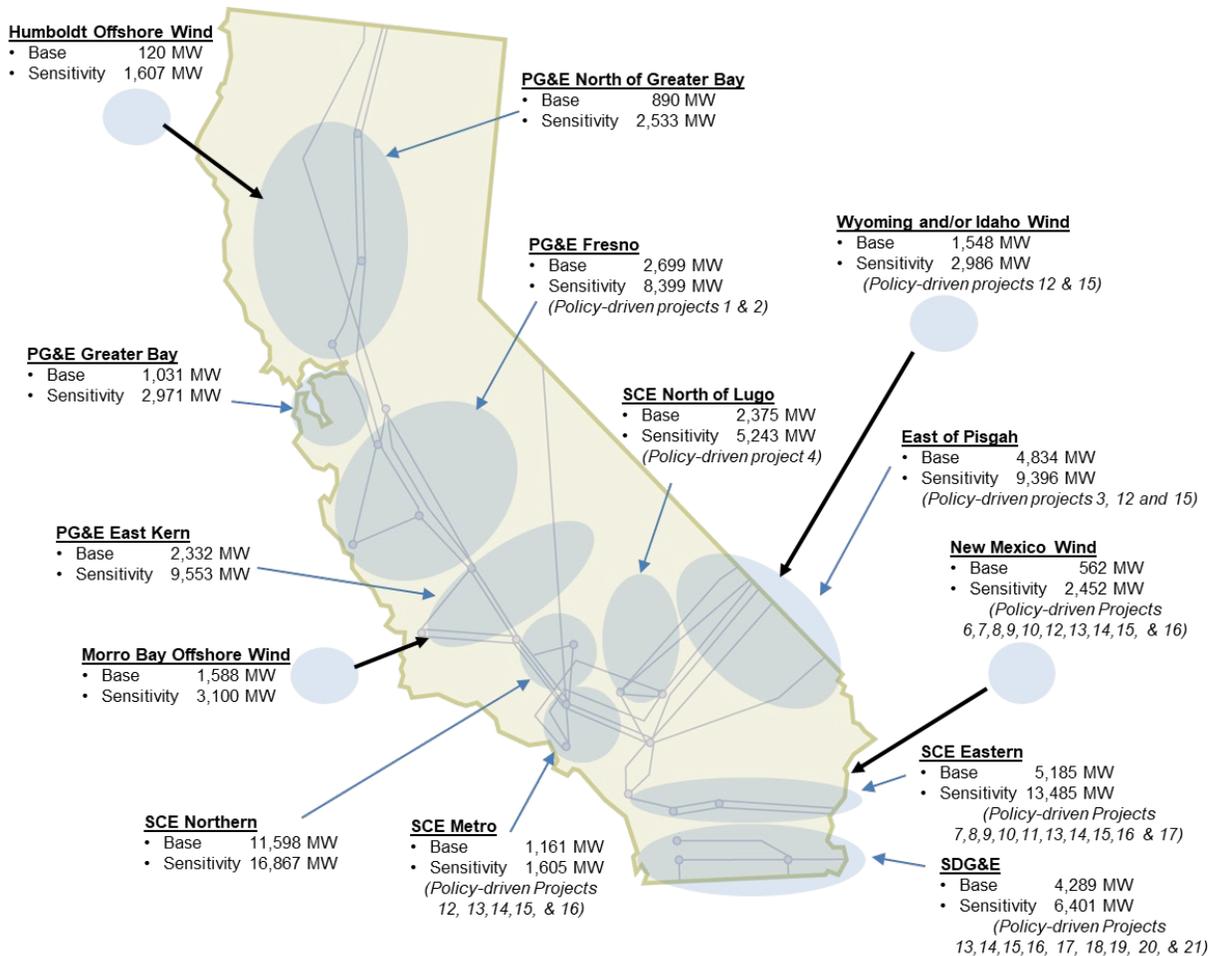
Figure ES-1 illustrates the specific zones and capacities in each zone enabled by this Transmission Plan. The network upgrades are recommended in this plan to make all of the base amounts available and, in Southern California, to also make most of the sensitivity⁸ amounts

⁷ The recommendation in the draft plan for the Trout Canyon-Lugo 500 kV, estimated at \$2 billion, has been held back pending additional analysis of stakeholder input and a recommendation will be brought to the Board at a later date.

⁸ The sensitivity portfolio was provided CPUC with higher levels of resource development than the ISO studied to develop transmission capacity and cost information that the CPUC uses in the next annual cycle of resource portfolio development. The ISO also considered the sensitivity case in selecting the preferred alternative to meet the needs identified in the base studies

available as well. As the CPUC has already determined that the sensitivity amounts in this year’s plan will be the base in next year’s transmission plan, the remaining network upgrades needed to achieve the sensitivity amounts will be approved next year.

Figure ES-1: Transmission Planning Zones and Capacity



The transmission projects represent significant investments that are phased in over lead times of up to eight to 10 years, which are reasonable for some of the projects to be completed. These costs translate to approximately 0.5 cents per kWh over the life of the projects, phased in as the new facilities come online. The costs for consumers are determined as part of the rate design process between utilities and their regulatory authorities. These projects are consistent with the ISO’s 20 Year Transmission Outlook and co-optimized with resource planning through the CPUC’s integrated resource planning process. The ISO also conducted detailed evaluations of alternatives to ensure the most efficient and cost effective long term solutions are achieved. The infrastructure investments also have tremendous reliability and economic benefits for California and its robust economy. Significant

Transmission projects are categorized as reliability-driven projects – those needed to serve load reliably meeting NERC national standards; policy driven projects needed to deliver renewable generation to load centers to meet state clean energy goals, and economic-driven projects that will reduce the cost of energy to ratepayers by, for example, reducing grid congestion costs.

amounts of new diverse generating capacity and the transmission upgrades are required to cost-effectively bring reliable decarbonized power to California consumers and industry across all seasons of the year.

Transmission Projects Recommended for Approval

The 46 reliability-driven and policy driven transmission projects that have been found to be needed are as follows:

- **Reliability-Driven Projects:** Reliability projects driven by load growth and evolving grid conditions as the generation fleet transitions to increased renewable generation represent 24 of the aforementioned projects, totaling \$1.76 billion. The projects are required to reliably supply the increase in forecasted load related to electrification and electric vehicle transportation loads. The 24 projects are set out in Table ES-1.

Table ES-1 Reliability-Driven Transmission Projects Recommended for Approval

Project Name	PTO Area	Planning Area	Cost (\$M)
Banta ring bus ⁹	PG&E	Central Valley	17.5
Metcalf 230/115 kV Transformers Circuit Breaker Addition ⁹	PG&E	Greater Bay Area	15.0
South Bay Area Limiting Elements Upgrade ⁹	PG&E	Greater Bay Area	11.0
Equipment Upgrade at CCSF Owned Warnerville 230 kV Substation ⁹	PG&E	Greater Fresno	1.6
Barre 230 kV Switchrack Conversion to Breaker-and-a-Half ⁹	SCE	Main	45
Mira Loma 500 kV Circuit Breaker Upgrade ⁹	SCE	Main	10
Garberville area reinforcement project	PG&E	Humboldt	204.0
Tulucay-Napa #2 60 kV line reconductoring project	PG&E	North Coast & North Bay	4.6
Santa Rosa 115 kV lines reconductoring project	PG&E	North Coast & North Bay	74.0
Tesla 115 kV Bus Reconfiguration Project	PG&E	Central Valley	55.0
Lone Tree – Cayetano – Newark Corridor Series Compensation	PG&E	Greater Bay Area	25.0
Los Banos 70 kV Area Reinforcement Project	PG&E	Fresno	60.0
Redwood City Area 115 kV System Reinforcement	PG&E	Greater Bay Area	110.8
Pittsburg 115 kV Bus Reactor project	PG&E	Greater Bay Area	26
Los Banos 230 kV Circuit Breaker Replacement	PG&E	Fresno	66
Panoche 115 kV Circuit Breaker Replacement and 230 kV Bus Upgrade project	PG&E	Fresno	184
North East Kern 115 kV Line Reconductoring Project	PG&E	Kern	256.0
Mesa Spare Transformer Installation	PG&E	Central Coast & Los Padres	24
Coolwater 1A 230/115 kV Bank Project	SCE	North of Lugo	47
Control 115 kV Shunt Reactor	SCE	North of Lugo	4
Serrano 4AA 500/230 kV Transformer Bank Addition	SCE	Main	120
Sylmar Transformer Replacement	SCE	Main	23
Antelope-Whirlwind 500 kV Line Upgrade Project	SCE	Main	6
Miguel-Sycamore Canyon 230 kV line Loop-in to Suncrest Projec	SDG&E	SDG&E	375
		Total	1,764.5

⁹ These projects have already been approved by ISO Management, ahead of the rest of the Plan being approved by the ISO's Board of Governors, pursuant to the ISO's tariff, after stakeholders were informed of Management's intention to approve, and given an opportunity to raise concerns with Management or the Board of Governors.

- In reviewing previously approved projects in the PG&E service territory in Chapter 2 that have subsequently been put on hold and were identified in the last planning cycle as needing more review, one project will continue to be on hold, another is recommended to be canceled and one is recommended to proceed with a modification to its original scope.

Policy-Driven Projects: The ISO found the need for an additional 21 transmission projects that are policy driven. These total \$5.53 billion and are listed in Table ES-2. They are needed to meet the renewable generation requirements established in the CPUC-developed renewable generation portfolios.

Table ES-2: Policy-Driven Transmission Projects Recommended for Approval

No.	Project Name	PTO Area	Geographic Area	Cost (\$M)
1	Borden-Storey 230 kV 1 and 2 Line Reconductoring	PG&E	Fresno	50
2	Henrietta 230/115 kV Bank 3 Replacement	PG&E	Fresno	20
3	Beatty 230 kV	VEA/GLW	East of Pisgah	155
4	Lugo-Victor-Kramer 230 kV Upgrade	SCE	North of Lugo	482
5	Colorado River-Red Bluff 500 kV 1 Line Upgrade	SCE	SCE Eastern	50
6	Devers-Red Bluff 500 kV 1 and 2 Line Upgrade	SCE	SCE Eastern	140
7	Devers-Valley 500 kV 1 Line Upgrade	SCE	SCE Eastern	40
8	Serrano-Alberhill-Valley 500 kV 1 Line Upgrade	SCE	SCE Eastern	60
9	San Bernardino-Etiwanda 230 kV 1 Line Upgrade	SCE	SCE Eastern	65
10	San Bernardino-Vista 230 kV 1 Line Upgrade	SCE	SCE Eastern	18
11	Vista-Etiwanda 230 kV 1 Line Upgrade	SCE	SCE Eastern	13
12	Mira Loma-Mesa 500 kV Underground Third Cable	SCE	SCE Metro	35
13	Imperial Valley-North of SONGS 500 kV Line and Substation	SDG&E	SDG&E	2,288
14	North of SONGS-Serrano 500 kV line	SDG&E / SCE	SDG&E and SCE Metro	503
15	Serrano-Del Amo-Mesa 500 kV Transmission Reinforcement	SCE	SCE Metro	1,125
16	North Gila-Imperial Valley 500 kV line	SDG&E	SDG&E (Potential Joint Project with IID)	340
17	Upgrade series capacitors on HW-NG and HA-NG to 2739 MVA	APS	APS	27
18	Rearrange TL23013 PQ-OT and TL6959 PQ-Mira Sorrento	SDG&E	SDG&E	21
19	Reconductor TL680C San Marcos-Melrose Tap	SDG&E	SDG&E	28
20	3 ohm series reactor on Sycamore-Penasquitos 230 kV line	SDG&E	SDG&E	8
21	Upgrade TL13820 Sycamore-Chicarita 138 kV	SDG&E	SDG&E	60
			Total	5,528

- The ISO has determined and included in the above transmission projects its internal transmission system requirements necessary to get access to out-of-state wind resources. These out-of-state resources have been identified by the CPUC and considered in the planning analysis by expanding the maximum import capability of the

internal ISO paths to import out-of-state wind.¹⁰ In addition to the study of the SWIP North project proposed by LS Power to access Idaho wind resources as a potential regional policy-driven transmission project discussed on the following page, the ISO has also been working with two subscription-based transmission developments seeking to bring wind resources in Wyoming (TransWest Express) and New Mexico (Sunzia) to the ISO boundary. Both transmission developments have sold transmission capacity on their planned facilities reaching to the ISO border to resource developers seeking to access California markets. That work is ongoing and the timing of those projects is driven by the developers and their subscribers.

- The ISO also continues working to refine its recommendation regarding the SWIP North project mentioned above taking into account participation interest of neighboring transmission service providers. This work will be conducted as an extension of the 2022-2023 Transmission Plan, with ISO Board of Governor approval anticipated to be sought in Q2 or Q3 of this year.
- **Economic-Driven Projects:** 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.
- **Competitive Transmission Procurement:** The ISO federal tariff sets out a competitive solicitation process for eligible reliability-driven, policy-driven and economic-driven regional transmission facilities found to be needed in the plan. The following projects – all found in Table ES-2 above - are eligible for competitive solicitation, and the ISO will provide a schedule for those processes in May, 2023:
 - 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.

Other Findings and Observations

In addition to the key findings listed above, other salient observations 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. The request, as set out in SB 887, was to ask the ISO to explore and

¹⁰ The base portfolio for the 2022-2023 transmission planning cycle includes 1,500 MW of out-of-state wind resources (1,062 MW from Wyoming or Idaho and 438 MW from New Mexico) and the sensitivity portfolio includes 4,832 MW (1,500 MW from Wyoming, 1,000 MW from Idaho and 2,328 MW from New Mexico).

consider approving the highest priority transmission facilities that are needed to allow for increased transmission capacity into local capacity areas to deliver renewable energy resources or zero-carbon resources that are expected to be developed by 2035. This review took into account:

- In calculating the economic benefits of reducing the need for gas-fired generation requirements in local capacity areas, the ISO calculated the economic benefit of reduced gas-fired generation output, and also considered the economic capacity benefit of less generation being needed for local capacity even if it is still needed for system capacity. While SB 887 calls for the CPUC to provide to the ISO by March 31, 2024, resource projections expected to reduce the need to rely on non-preferred resources in local capacity areas by 2035, these projections are not yet reflected in the portfolios provided by the CPUC for the 2022-2023 Plan and the gas-fired generation is being relied upon across the planning horizon for system capacity.
- The ISO has identified 12 reliability-driven and policy-driven projects recommended for approval in this transmission plan that also reduce gas-fired generation local capacity requirements, and that are listed in Table ES-1 or Table ES-2 above:
 - Metcalf 230/115 kV Transformers Circuit Breaker Addition project (reliability-driven) – Section 2. This project is recommended to address reliability needs in the Greater Bay Area. This project, along with the two HVDC projects in the San Jose area in the 2021-2022 Transmission Plan, will reduce the local capacity requirements within the San Jose LCR sub-area.
 - The seven recommended upgrades to four existing 500 kV lines and three 230 kV lines in the SCE Eastern area (Section 3.5.8) and the addition of the third cable addition to the Mesa-Mira Loma 500 kV underground section (Section 3.5.7) will increase the 500 kV and 230 kV supply to the LA Basin area.
 - The three southern area reinforcement projects (the Imperial Valley–North of SONGS 500 kV Line and Substation, North of SONGS–Serrano 500 kV Line, and Serrano–Del Amo–Mesa 500 kV Transmission Reinforcement projects) will increase the transmission capacity in the LA Basin by establishing a 500 kV source at the existing Del Amo 230 kV substation, and in the San Diego and LA Basin local capacity areas by establishing a new 500 kV source north of San Diego.
- The ISO has also reviewed the Pacific Transmission Expansion Project - a multi-terminal HVDC project from Diablo Canyon 500 kV substation to multiple 230 kV substations in the LA Basin area - that was submitted into the Economic Request window in the 2022-2023 transmission planning process. The ISO has also been in discussion with the Los Angeles Department of Water and Power (LADWP) about its potential interest in the project and the possibilities of a joint project;

however, the ISO is not aware of any decisions by LADWP to move forward at this time. The project can provide improved access to future offshore wind development, offload congestion on Path 26, and reduce gas-fired generation local capacity requirements. However, an ISO recommendation to approve this project will ultimately depend heavily upon the pace and volume of gas-fired generation retirements planned in the LA Basin. The ISO will continue to explore gas-fired generation retirement plans with the CPUC and work with LADWP on potential collaboration opportunities after the Plan has been approved.

- **North Coast Offshore Wind:** Based on the sensitivity portfolio provided by the CPUC, the ISO studied the need for transmission capacity from the North Coast for offshore wind. As the study was only informational and set the stage for future planning, no projects were recommended for approval in this 2022-2023 Plan. Given the growing volumes already identified in the North Coast in the renewable generation portfolios provided for the 2023-2024 planning cycle, the ISO expects to make a decision on North Coast transmission in next year's transmission plan.
- **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 Northern Grid. Of the seven potential projects submitted into the ISO's 2023 interregional transmission project (ITP) submission window in the first quarter of 2022, only the North Gila – Imperial Valley No. 2 project met the requirements of an interregional transmission project in the submission validation process and received further detailed review by WestConnect and the ISO. Although WestConnect's subsequent review did not find a need for the project, it was determined to be necessary by the ISO and is recommended for approval as a regional ISO project as shown in Table ES-2.

Other 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 additional local capacity technical study analyses, frequency response analysis, examination of viability of congestion revenue rights, and a preliminary assessment of the transmission impact of potential reduced reliance on Aliso Canyon. The latter informational study highlights the potential need for additional transmission in the LA Basin and San Diego local capacity areas if there is reduced reliance on the Aliso Canyon Natural Gas Storage Facility in the future and is being shared with the CPUC.

These studies are set out in Chapter 6 and Chapter 7.

Conclusions and Recommendations

The 2022-2023 Transmission Plan provides a comprehensive evaluation of the ISO transmission grid to identify upgrades needed to adequately keep pace with California's policy goals, address grid reliability requirements, identify zones of resource development and bring economic benefits to consumers. This year's plan identified 46 transmission projects, estimated to cost a total of \$9.3 billion, as needed to maintain the reliability of the ISO transmission system and unlock access to renewable generation resources to meet state energy needs.

Once approved by the ISO Board of Governors at its May, 2023 meeting, the plan serves to:

- Authorize cost recovery for the 46¹¹ identified transmission solutions through ISO transmission rates, subject to regulatory approval; and
- Initiate the ISO's competitive solicitation process for the four eligible projects identified above.

As well, the ISO will conduct additional stakeholder and market outreach regarding the SWIP North project, as a continuation of the 2022-2023 transmission planning cycle and will conclude that effort in Q3, 2023. The ISO will also continue to explore gas-fired generation retirement plans with the CPUC and work with LADWP on potential collaboration opportunities regarding the Pacific Transmission Expansion Project both leading up to presenting this Plan to the ISO Board of Governors for approval, and after the Plan has been approved.

¹¹ As noted earlier, 6 reliability projects have already been approved by Management pursuant to the ISO tariff, and do not require additional approval by the Board of Governors.