

Memorandum

To: ISO Board of Governors
From: Keith Casey, Vice President, Market & Infrastructure Development
Date: March 14, 2018
Re: **Decision on the ISO 2017-2018 transmission plan**

This memorandum requires Board 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 2017-2018 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. The tariff requires Board approval of the transmission plan. Accordingly, Management recommends the Board approve the ISO transmission plan for the 2017-2018 planning cycle, included as Attachment A.

The number and capital costs of recommended transmission projects in the 2017-2018 transmission plan represent a modest increase from the low amounts experienced in recent years. While the previous lows were due to the considerable progress made in earlier planning cycles in identifying and approving a wide array of transmission projects, emerging issues and evolving economic opportunities as well as localized load growth have led to more development being identified in this cycle. Policy-driven transmission has not played a role in this year's transmission plan, however, as earlier cycles addressed the policy-driven transmission needs to achieve a 33% Renewables Portfolio Standard. While California Senate Bill 350, the Clean Energy and Pollution Reduction Act of 2015, which was signed into law on October 7, 2015, established among other goals a 50% renewables portfolio standard by 2030, the implementation details for achieving the goal are not yet ready to inform transmission planning approvals.

In addition to the approval of the overall findings and conclusions documented in the transmission plan, and summarized in this memorandum, Management requests that the Board approve seven reliability-driven transmission projects identified as needed to ensure compliance with NERC and ISO planning standards and three economic-driven transmission projects. These projects are in addition to the six reliability-driven projects

and one economic-driven project already approved by Management under its existing approval authority for projects costing less than \$50 million. All seventeen of these projects have estimated costs totaling approximately \$271.3 million, none of which are eligible for competitive solicitation.

Other key findings and conclusions from the 2017-2018 transmission plan include:

- No policy-driven transmission projects were identified as needed for meeting the 33% RPS state policy objective.
- The third and final year of a major programmatic review of previously-approved transmission projects in the PG&E service territory, given materially-changed circumstances underpinning the original need for the projects, resulted in recommendations to cancel 18 transmission projects in the PG&E service area and major scope revisions to 21 projects, paring approximately \$2.6 billion from the current estimates of all previously-approved projects. Further, Management recommends that 7 projects in the PG&E service area remain or be placed on hold pending further review in future planning cycles.
- Two projects in the SDG&E service territory are recommended to be canceled.

The ISO produced this transmission plan after engaging in an extensive stakeholder process. We communicated preliminary results through stakeholder presentations on September 21 and 22, and on November 16, 2017. The ISO released a draft plan on February 1, 2018 and presented it at a stakeholder session on February 8, 2018. Based on comments received from stakeholders, we conducted additional review and made further revisions, culminating in the revised draft ISO 2017-2018 transmission plan. Management proposes the following motion:

Moved, that the ISO Board of Governors approves the ISO 2017-2018 transmission plan attached to the memorandum dated March 14, 2018.

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.

Advancing preferred resources

Increased opportunity for non-transmission alternatives, particularly preferred resources and storage, continues to be a key focus of the transmission planning analysis. In this regard, the ISO's transmission planning efforts focus on not only meeting the state's policy objectives through advancing policy-driven transmission, but also to help 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.

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.

The ISO's reliance on preferred resources to address specific reliability needs has been summarized in section 7.3 of the transmission plan, in addition to being discussed throughout the plan on an area-by-area study basis. As noted below, preferred resources including battery storage have been identified as the preferred

option to meeting reliability needs working together with conventional transmission upgrades in several areas – Moorpark and Oakland in particular.

Collaborative planning efforts

The ISO, utilities, the California Energy Commission, the California Public Utilities Commission and other stakeholders worked closely together to ensure alignment of key planning assumptions within the three core planning processes, in particular a single “managed” load forecast, and to assess how to meet the environmental goals established by state policy.

The three core planning processes are the:

- Long-term forecast of energy demand produced by the CEC as part of its biennial Integrated Energy Policy Report (IEPR),
- Biennial integrated resource plan proceedings (IRP) and long term procurement plan proceedings (LTPP) conducted by the CPUC, and
- Annual Transmission Planning Process (TPP) performed by the ISO.

The results of the CPUC’s annual process feeding into this 2017-2018 transmission planning process were communicated via an assigned commissioner’s ruling in the CPUC’s Integrated Resource Plan Process.¹ These assumptions were further vetted by stakeholders through the stakeholder process in developing the 2017-2018 study plan.

KEY FINDINGS

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

Reliability-driven transmission projects

Thirteen reliability-driven transmission projects were identified as needed in this planning cycle to ensure compliance with NERC and ISO planning standards, representing an investment of approximately \$182.3 million in infrastructure additions to the ISO-controlled grid.

Two of these, the Moorpark 230 kV circuit and the Oakland Clean Energy Initiative, are noteworthy in being part of comprehensive solutions including conventional transmission reinforcement and preferred resources. The Moorpark project is part of the solution to

¹ The “Draft 2017 Assumptions and Scenario for Long Term Planning” is included as an attachment to Administrative Law Judge Julie A. Fitch’s ruling seeking comment, issued in CPUC Proceeding No. R.16-02-007, January 18, 2017, <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M172/K519/172519400.PDF>.

allow the remaining once-through cooling generation in the area to retire on its compliance schedule, and the Oakland Clean Energy Initiative allows for the eventual retirement of the Oakland Generation Station. The latter project, the Oakland Clean Energy Initiative, is also one of two projects where the transmission plan includes selecting batteries to be procured as transmission assets to meet grid reliability needs – also a first for the ISO transmission planning process.

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.

Continuing with the review commenced in the previous two planning cycles, the ISO has completed its comprehensive and programmatic review of a large number of previously-approved transmission projects in the PG&E service territory, and identified 18 projects that are recommended to be canceled and 21 requiring material scope modifications. These recommendations reflect a number of changing circumstances from when the projects were approved several years ago. The most significant changes mitigating the need for these projects were declining load forecasts and increased penetration of distributed renewable energy resources and their associated production profiles. The ISO also identified 7 other projects requiring further review in future planning cycles.

Further, two previously approved reliability projects in the SDG&E area are recommended to be canceled – one of them, the Mission-Penasquitos project, was noted to be needing further review in the 2016-2017 Transmission Plan and the change resulted from the siting decision of the CPUC in approving the Sycamore-Penasquitos project.

Transmission elements supporting renewable energy goals

The CPUC and CEC provided policy direction to the ISO regarding renewable generation portfolios for 2017-2018 policy-driven transmission planning purposes via the assigned commissioner ruling referenced above. The ISO was asked to continue to re-use the "33% 2025 Mid AAEE" RPS portfolio used in the 2015-16 TPP studies, as the base case renewable resource portfolio in the 2017-2018 TPP studies.² Because these portfolios were already studied in the 2015-2016 TPP and again in

² <http://www.caiso.com/Documents/2016-2017RenewablePortfoliosTransmittalLetter.pdf>

the 2016-2017 TPP, the ISO first ensured that no material changes to other planning assumptions had occurred that would affect the ability to deliver renewable generation in the portfolio, and then determined that there was no need for further detailed generation deliverability analysis to support the 33% RPS portfolios.

Elements of 2017-2018 ISO Transmission Plan Supporting Renewable Energy Goals

Transmission Facility	Online
Transmission Facilities Approved, Permitted and Under Construction	
West of Devers Reconductoring	2021
Sycamore – Penasquitos 230kV Line	2018
Eldorado-Mohave and Eldorado-Moenkopi 500 kV Line Swap	Completed January 2018
Additional Network Transmission Identified as Needed in ISO Interconnection Agreements but not Permitted	
None at this time	
Policy-Driven Transmission Elements Approved but not Permitted	
Lugo – Eldorado series cap and terminal equipment upgrade	2020
Warnerville-Bellota 230 kV line reconductoring	2022
Wilson-Le Grand 115 kV line reconductoring	2020
Suncrest 300 Mvar SVC	2017 ³
Lugo-Mohave series capacitors	2020
Additional Policy-Driven Transmission Elements Recommended for Approval	
None identified in 2017-2018 Transmission Plan	

³ In service date to be revisited by project sponsor now that the Environmental Impact Report has recently been completed.

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 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.

The production cost simulation was conducted in this economic planning study and grid congestion was identified and evaluated. Detailed congestion investigation and production benefit assessments were conducted for the selected congestions that showed as potential economically-driven projects because of either recurring congestion, high congestion cost, or relatively low capital cost of potential mitigations. Other benefits, particularly local capacity benefits, were also assessed for two study areas.

In summary, four upgrades⁴ were found to be needed as economic-driven projects in the 2017-2018 planning cycle. They are:

- The S-Line Upgrade, providing congestion and local capacity benefits;
- The Bob to Mead 230 kV Line Upgrade, providing congestion benefits; and,
- Two South Bay-Moss Landing enhancements comprised of the San Jose-Trimble 115 kV series reactor and the Moss Landing–Panoche 230 kV Path Upgrade, providing local capacity benefits.

Competitive solicitation for new transmission elements

The ISO's transmission planning process includes a competitive solicitation process for reliability-driven, policy-driven and economically-driven transmission facilities over 200 kV. Upgrades or additions to an existing participating transmission owner facility

⁴ The Moorpark-Pardee 4th Circuit found to be needed in this transmission plan can also be considered an economic-driven project, but has been included as part of the more comprehensive reliability-driven requirements discussion set out in chapter 2 for the Moorpark Sub-area. Section 24.4.6.7 of the ISO tariff states: "...the CAISO will conduct the High Priority Economic Planning Studies selected under Section 24.3.4 and any other studies that the CAISO concludes are necessary to determine whether additional transmission solutions are necessary to address: ... (b) Local Capacity Area Resource requirements;"

and the construction or ownership of facilities within an existing participating transmission owner's substation are excluded from competition.

None of the transmission projects in this transmission plan includes facilities eligible for competitive solicitation.

Special studies conducted in the planning process

In parallel to the mandated analysis framework set out in the tariff described above, the ISO also undertook a number of special studies to help prepare for future planning cycles by reaching further into the issues emerging through the transformation of the California electricity grid. These studies are provided on an informational basis only, and are not the basis for identifying needs or mitigations for ISO Board decision in this planning cycle. A number of the special studies extended the analysis initially conducted in the 2016-2017 cycle. The special studies undertaken in this planning cycle and the issues driving those studies are summarized below:

Addendums performed as extensions of the 2016-2017 transmission planning cycle

- **50 percent renewable generation and interregional coordination.** These studies explored implications of various 50% renewable generation portfolios considering continued reliance on incremental renewable generation to provide full capacity delivery status resource adequacy capacity, focusing in this planning cycle primarily on transmission issues related to out-of-state generation identified in the previous planning cycle. The analysis also concluded the ISO's review of a number of interregional project submissions through coordination with the ISO's neighboring western planning regions under our respective FERC Order No. 1000 interregional coordination efforts.
- **Risks of early economic retirement of gas fleet.** The 2016-2017 analysis explored both localized risks as well as system-wide reliability requirements. In this planning cycle, further sensitivities were conducted.
- **Large-scale storage benefits.** These studies updated the information-only efforts undertaken in the previous two planning cycles, and updated the results for potential system benefits in particular.

Further study work conducted as part of the 2017-2018 transmission planning cycle

- **Continuation of frequency response analyses through improved modeling.** Study efforts have continued from the last two cycles, continuing to concentrate on identifying and addressing generator modeling issues, and

updating frequency response studies. These efforts will continue on an ongoing basis to support BAL-003 requirements and to support compliance with NERC standards MOD-032 and MOD-033.

Further study work moving into specific regulatory processes

- **Gas/electric reliability coordination.** These efforts focused on preparation to support the CPUC processes examining Aliso Canyon issues.
- **Slow-response resources in local capacity areas.** These studies concluded the ISO's initial study efforts identifying the necessary characteristics for slow-response resources to be capable of providing local resource capacity. Further efforts will continue to support the CPUC's resource adequacy proceedings.

STAKEHOLDER FEEDBACK

Stakeholders have provided feedback on the draft ISO 2017-2018 transmission plan that was released on February 1, 2018, and presented at a stakeholder meeting on February 8, 2018, as well as following a stakeholder call on January 11, 2018 addressing details of the Moorpark plan and the proposed S-Line Upgrade project. The more significant stakeholder concerns, and our response to those concerns, are summarized below.

- **General support for individual projects** – Stakeholders generally support the projects recommended for approval. Concerns have been expressed with the consideration of certain projects on a case-by-case basis, in particular for the S-Line upgrade (regarding potential alternatives as well as the opportunity to fund the upgrades), Moorpark (regarding the potential for more preferred resources in lieu of the transmission upgrade), and certain revised, previously-approved projects to be eligible for competition. Proponents of projects the ISO has not found to be needed have also provided feedback supportive of those projects.

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

- **General support with some concerns for projects being canceled or held for further review** – Stakeholders generally support the cancellation of the projects identified for cancellation. Concerns have been expressed that the comprehensive review should be repeated each year forward, rather than reverting to a case-by-case review. Concerns have also been expressed that projects should not be canceled too hastily, either from concern that generator

interconnection proposals could be impacted or that re-starting those projects would be administratively cumbersome, time consuming and costly.

ISO response: The ISO has reviewed all of the stakeholder comments carefully, and has concluded that the recommendations made in the transmission plan are appropriate. Responding to stakeholder feedback, a number of projects are not being recommended for cancellation, but rather are being recommended to for further review on a case-by-case basis. Regarding generation interconnection proposals, the ISO has reviewed all projects recommended to be canceled, and verified that interconnecting generators will not be negatively impacted by these changes.

- ***Special Studies*** – As was the case last year, there was strong interest in the special studies conducted in the transmission planning cycle, and numerous comments requesting the additional analysis be continued in future planning cycles – regarding out-of-state wind generation in particular.

ISO response: These issues are a topic for the 2018-2019 transmission planning study program development, and will be addressed in that venue. The ISO's 2017-2018 transmission plan completed the work identified last year to conduct additional sensitivities on key issues and concluded the study efforts in those areas. While additional analysis of some issues may be warranted in the future, the ISO does not see that there is material new input to inform re-doing these studies, and that the timing of additional studies in the 2018-2019 cycle would not align with the load serving entities' development of their preferred resource plans in any event.

CONCLUSION

The 2017-2018 ISO transmission plan provides a comprehensive evaluation of the ISO transmission grid to identify upgrades needed to adequately meet California's policy goals, address grid reliability requirements and bring economic benefits to consumers. This year's plan identified seventeen transmission projects, having an estimated cost of approximately \$271.3 million, as needed to maintain the reliability of the ISO transmission system and provide for the economic operation of the grid. Further, the plan has identified 20 previously approved projects that can be canceled, 21 previously approved projects that can be re-scoped, and 7 projects that require further review before proceeding to construction.

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 system, Management recommends that the Board approve the attached ISO 2017-2018 transmission plan.