

The CAISO received comments on the topics discussed at the April 18, 2024 stakeholder call from the following:

- A. ACP – California
- B. Avangrid Renewables
- C. Bay Area Municipal Transmission Group (BAMx)
- D. California Public Utilities Commission
- E. California Public Utilities Commission – Public Advocates Office
- F. CEERT and LEAP
- G. City of San Jose
- H. Defenders of Wildlife
- I. Fervo Energy Company
- J. Invenergy
- K. LSA
- L. PG&E
- M. RWE Renewables

Copies of the comments submitted are located on the Transmission Planning Process page at:

<https://stakeholdercenter.caiso.com/RecurringStakeholderProcesses/20-Year-transmission-outlook-2023-2024>

The following are the CAISO's responses to the comments

1. [Please provide your organization's comments on the mitigation measures](#)
2. [Please provide any additional comments your organization has on the 20-Year Transmission Outlook update](#)

1. Please provide your organization's comments on the mitigation measures			
No	Submitting Organization	Comment Submitted	CAISO Response
1A	ACP-California	ACP-California appreciates CAISO's efforts to compile the 20-Year Outlook Update and, furthermore, appreciates that CAISO is studying a variety of mitigation measures as part of the 20-Year Outlook Update. This includes assessing different ways to integrate resources from out of state onto the CAISO grid. Assessing alternatives is an important part of the 20-Year Outlook and we look forward to the results that are published in the report coming out later this spring.	Thank you for your comment.
1B	Avangrid Renewables	No comment	
1C	Bay Area Municipal Transmission Group (BAMx)	<p>The Bay Area Municipal Transmission Group (BAMx) appreciates the opportunity to comment on the CAISO 20-Year Transmission Outlook (20-Year Outlook, hereafter) presented at the CAISO Stakeholder meeting on April 18, 2024. BAMx acknowledges the significant effort of the CAISO staff in developing this material.</p> <p><u>BAMx Applauds CAISO's High-Level Benefit-Cost Analysis of Transmission Alternatives to Access OOS Wind</u></p> <p>During the April 18th presentation, the CAISO indicated that the new transmission projects could either bring the Out-of-State (OOS) wind to the border of the CAISO system, requiring additional transmission within the CAISO system, or could be brought to interconnection points within the CAISO, such as Tesla and Lugo substations as examples. In our January 18th comments, BAMx had requested that any high-level assessment of both alternatives performed as part of the 20-Year Outlook assessment should compare the total cost of the connections to the border and required internal upgrades versus the total cost of the connections to interconnection points/substations within the CAISO and required internal upgrades. BAMx is thankful that the CAISO has determined that connection of the out-of-state wind to a substation closer to the load centers in the CAISO system could potentially be beneficial as compared to interconnecting out-of-state wind power to a substation at the CAISO border and then reinforcing CAISO system to deliver power from the border to the load centers.[2]</p>	<p>Thank you for your comment.</p> <p>Thank you for your comment.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p><u>Further Technical Evaluation of OSW Transmission Projects Needs to Be Accompanied By High-Level Permitting/Feasibility/Environmental Assessment</u></p> <p>Integrating North Coast Offshore Wind (OSW) is a challenging objective with technical, environmental, and scheduling risks. Such risks suggest value in staging transmission improvements so that decisions on higher-cost and technically challenging elements are made later in the process once better information is available. The choice between the terrestrial alternatives (Fern Road or Collinsville) will likely depend on environmental factors, among other things. We understand the CAISO has not yet fully considered the environmental and permitting constraints of these transmission options because these alternatives are still in their early development stage.</p> <p>It appears that transmission options for integrating North Coast OSW, namely Option A and Option B, are based on the transmission alternatives considered in the Schatz Energy Research Center's Northern California and Southern Oregon Offshore Wind Transmission (NCSO-OWT) Study.^[3] For example, the California portion of two options considered by the CAISO in the 20-Year Transmission Outlook Update closely resembles Alternative 25.8a and 25.8b considered in the NCSO-OWT study.</p> <p>The NCSO-OWT study also includes a high-level assessment of permitting challenges for transmission routes. It identifies significant permitting challenges for the transmission segments for the options considered by the CAISO. For example, the Humboldt-Fern Road 500kV AC line is deemed to be in the category of high barriers for the following reasons.^[4] It runs roughly parallel to Highways 299 and 36 and is ranked as having "high" barriers to development. Here, challenges in permitting are associated with Tribal lands, two national forests, the Humboldt Bay National Wildlife Refuge, and the Trinity Wild and Scenic River. Closer to the coast, both routes would require permitting from the Humboldt Bay Harbor, Recreation, and Conservation District. It is of particular concern as the CAISO has recommended the Humboldt-Fern Road 500kV AC project as a policy-driven project in the 2023-2024 TPP. CAISO's approval of any green-field policy-driven transmission project</p>	<p>Thank you for your comment</p> <p>CAISO evaluated those alternatives in the 2021-2022 Transmission Plan and recommended them for consideration to the Schatz Energy Research Center's Northern California and Southern Oregon Offshore Wind Transmission (NCSO-OWT) Study team.</p> <p>The 20-year transmission outlook analysis focuses on the technical assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis will be performed as part of the Tariff-based 10-year transmission planning process and the optimum solutions will be recommended for approval. Such detailed analysis will be performed in coordination with state agencies and takes into account permitting feasibility.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>without considering the feasibility challenges and environmental permitting constraints for transmission development would be ill-advised and counter-productive. Therefore, BAMx recommends that the CAISO conduct a high-level feasibility and environmental permitting assessment before recommending any particular transmission project to access North Coast OSW. Waiting to perform such an assessment only during a competitive solicitation process when the project is already approved by the CAISO Board may not be the most efficient process in building transmission projects to meet the State policy goals.</p> <p>Another example of the permitting challenges identified in the NCSO-OWT study is the Cape Mendocino to Bay Hub HVDC and Cape Mendocino – Moss Landing HVDC line segments included in CAISO’s April 18th presentation, which have been ranked with “very high” barriers to development. According to the NCSO-OWT study, “These include potential impacts to state and federal threatened or endangered species and impacts to marine protected areas, national marine sanctuaries, and biologically important areas, as well as potential impacts to San Francisco Bay and the Delta. Cable routing into the San Francisco Bay requires coordination with several additional agencies, further complicating the permitting process.” BAMx urges the CAISO to include a discussion of these potential permitting challenges in the Final 20-Year Outlook Update so that the stakeholders are aware of them as they consider transmission reliability and policy benefits associated with the transmission options to integrate North Coast OSW.</p> <p><u>CAISO Should Provide Detailed Breakdown of Transmission Costs</u></p> <p>BAMx appreciates the CAISO providing the per-unit cost estimates during the April 18th stakeholder meeting. BAMx requests the CAISO to provide a spreadsheet showing how the overall cost estimates were developed for each transmission element for each option. BAMx is not entirely sure, but we have attempted to calculate the overall cost of offshore wind interconnection under two transmission options, i.e., Option A and Option B, as shown below. Our calculations indicate that they cost approximately \$24.5B-\$35.4B and \$22.9B-\$33.0B, respectively. Please confirm these</p>	<p>Thank you for your comment. The final 20-year Outlook will highlight some of the implementation challenges.</p> <p>The overall cost of each transmission concept will be included in the final 20-year outlook.</p>

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		<p>calculations and include similar tables in the Final 20-Year Transmission Outlook Update.</p> <table border="1" data-bbox="533 334 1213 1354"> <thead> <tr> <th data-bbox="533 334 930 402">Transmission Facility</th> <th data-bbox="930 334 1071 402">Option A (M\$)</th> <th data-bbox="1071 334 1213 402">Option B (M\$)</th> </tr> </thead> <tbody> <tr> <td data-bbox="533 402 930 470">2nd 500 kV line From Humboldt to Fern Road</td> <td data-bbox="930 402 1071 470">\$980-\$1,400</td> <td data-bbox="1071 402 1213 470">\$-\$</td> </tr> <tr> <td data-bbox="533 470 930 539">500 kV line From Del Norte to Fern Road</td> <td data-bbox="930 470 1071 539">N/A</td> <td data-bbox="1071 470 1213 539">\$1,540-\$2,200</td> </tr> <tr> <td data-bbox="533 539 930 607">Cape Mendocino to Bay Hub HVDC</td> <td data-bbox="930 539 1071 607">\$5,124-\$7,320</td> <td data-bbox="1071 539 1213 607">\$2,562-\$3,660</td> </tr> <tr> <td data-bbox="533 607 930 675">Cape Mendocino – Moss Landing HVDC line</td> <td data-bbox="930 607 1071 675">N/A</td> <td data-bbox="1071 607 1213 675">\$2,996-\$4,280</td> </tr> <tr> <td data-bbox="533 675 930 743">2GW HVDC converter station (12 – 14)</td> <td data-bbox="930 675 1071 743">\$5,600-\$8,400</td> <td data-bbox="1071 675 1213 743">\$4,800-\$7,200</td> </tr> <tr> <td data-bbox="533 743 930 812">Del Norte to Humboldt HVDC (3 HVDC lines)</td> <td data-bbox="930 743 1071 812">\$1,470-\$2,100</td> <td data-bbox="1071 743 1213 812">\$1,470-\$2,100</td> </tr> <tr> <td data-bbox="533 812 930 880">Del Norte to Humboldt HVDC (1 HVDC lines)</td> <td data-bbox="930 812 1071 880">\$490-\$700</td> <td data-bbox="1071 812 1213 880">N/A</td> </tr> <tr> <td data-bbox="533 880 930 948">Cape Mendocino - Humboldt HVDC line</td> <td data-bbox="930 880 1071 948">\$1,750-\$2,500</td> <td data-bbox="1071 880 1213 948">\$1,750-\$2,500</td> </tr> <tr> <td data-bbox="533 948 930 1016">500 kV HVDC line to Collinsville</td> <td data-bbox="930 948 1071 1016">\$1,813-\$2,590</td> <td data-bbox="1071 948 1213 1016">\$1,813-\$2,590</td> </tr> <tr> <td data-bbox="533 1016 930 1084">3GW HVDC converter station (4)</td> <td data-bbox="930 1016 1071 1084">\$2,400-\$3,600</td> <td data-bbox="1071 1016 1213 1084">\$2,400-\$3,600</td> </tr> <tr> <td data-bbox="533 1084 930 1153">230 kV AC cables to Potrero, East Shore, Los Esteros</td> <td data-bbox="930 1084 1071 1153">\$990-\$1,320</td> <td data-bbox="1071 1084 1213 1153">\$990-\$1,320</td> </tr> <tr> <td data-bbox="533 1153 930 1221">230 kV AC cables to San Mateo, Newark, Monta Vista</td> <td data-bbox="930 1153 1071 1221">\$1,425-\$1,900</td> <td data-bbox="1071 1153 1213 1221">N/A</td> </tr> <tr> <td data-bbox="533 1221 930 1289">Fern Road to Vaca Dixon to New Tesla (2 x 500 kV lines)</td> <td data-bbox="930 1221 1071 1289">\$2,532-\$3,545</td> <td data-bbox="1071 1221 1213 1289">\$2,532-\$3,545</td> </tr> <tr> <td data-bbox="533 1289 930 1354">Total (M\$)</td> <td data-bbox="930 1289 1071 1354">\$24,574-\$35,375</td> <td data-bbox="1071 1289 1213 1354">\$22,853-\$32,995</td> </tr> </tbody> </table> <p data-bbox="533 1354 1213 1386">Data Source: CAISO April 18ⁿ Presentation, pp. 32, 48, 49.</p>	Transmission Facility	Option A (M\$)	Option B (M\$)	2nd 500 kV line From Humboldt to Fern Road	\$980-\$1,400	\$-\$	500 kV line From Del Norte to Fern Road	N/A	\$1,540-\$2,200	Cape Mendocino to Bay Hub HVDC	\$5,124-\$7,320	\$2,562-\$3,660	Cape Mendocino – Moss Landing HVDC line	N/A	\$2,996-\$4,280	2GW HVDC converter station (12 – 14)	\$5,600-\$8,400	\$4,800-\$7,200	Del Norte to Humboldt HVDC (3 HVDC lines)	\$1,470-\$2,100	\$1,470-\$2,100	Del Norte to Humboldt HVDC (1 HVDC lines)	\$490-\$700	N/A	Cape Mendocino - Humboldt HVDC line	\$1,750-\$2,500	\$1,750-\$2,500	500 kV HVDC line to Collinsville	\$1,813-\$2,590	\$1,813-\$2,590	3GW HVDC converter station (4)	\$2,400-\$3,600	\$2,400-\$3,600	230 kV AC cables to Potrero, East Shore, Los Esteros	\$990-\$1,320	\$990-\$1,320	230 kV AC cables to San Mateo, Newark, Monta Vista	\$1,425-\$1,900	N/A	Fern Road to Vaca Dixon to New Tesla (2 x 500 kV lines)	\$2,532-\$3,545	\$2,532-\$3,545	Total (M\$)	\$24,574-\$35,375	\$22,853-\$32,995		
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		<p>Also, please clarify why the cost associated with the 500 kV HVDC line to Collinsville, i.e., \$1,813M-\$2,590M, assumes only a single HVDC line, while the diagrams for both Option A and Option B show two lines.</p> <p>BAMx appreciates the CAISO's due diligence in considering the routing challenges of the undersea cables. For example, the seemingly significant mileage (nearly 250 miles?) for the Cape Mendocino—Humboldt HVDC line reflects topographical challenges because of the deep underwater canyons in the region, adding significant cable lengths. As mentioned earlier, the CAISO needs to extensively discuss the routing and permitting associated with the transmission options in the final 20-Year Outlook Update report.</p> <p>One thing that all stakeholders will do upon the CAISO's issuance of the 20-Year Transmission Outlook Report (expected in June 2024) is to compare it with the earlier 20-Year Outlook report issued in May 2022. And some questions will be asked, such as</p> <ul style="list-style-type: none"> • Are the recommended transmission upgrades envisioned in the June 2024 report incremental to May 2022, or do they purely replace them? • Why are the transmission upgrades identified in the June 2024 report so different from those in the May 2024 report? What are the drivers? <p>BAMx encourages the CAISO to include the explanations behind the differences between the two reports in the June 2024 report. These may include changes in the assumed resource mix, transmission projects approved in the last two TPP cycles, per-unit transmission cost assumptions, etc., and to what extent these drivers have contributed to the differences.</p> <p><u>Detailed Assumptions and Results Should be Provided Well in Advance to Interpret the Preliminary High-Level Technical Assessment Results Meaningfully</u></p> <p>BAMx appreciates the preliminary results of the High System Need (HSN) scenarios provided by the CAISO during the meeting on</p>	<p>One HVDC line from Humboldt to Collinsville (initially operated as a 500 kV AC line) is approved in the 2023-2024 TPP and therefore is considered in the base case for the 20-year outlook study.</p> <p>Thank you for your comment. The final 20-year Outlook will highlight some of the implementation challenges.</p> <p>A discussion on comparison of the transmission projects considered in the 2024 outlook with the 2022 outlook will be provided in the final report</p> <p>Thank you for your comment</p>

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		<p>January 4th, but were not discussed during the April 18th meeting. The summary results in the January 4th presentation also did not give a complete picture. For instance, which N-1 contingency under the High OSW scenario causes a potential overload on the Embarcadero - Potrero 230 kV line is unclear.[5] Also, these summary results do not provide much insight into how those findings align with the HSN scenario results for the Sensitivity Case in the 2023-2024 TPP.[6] For instance, the summary results do not show any overload on the <i>Collinsville – Pittsburg 230 kV line Constraint</i> leading to the need for <i>Collinsville 230 kV Reactor</i> or <i>North Dublin - Vineyard 230 kV Constraint</i> triggering reconductoring. BAMx requests that the CAISO provide detailed assumptions and results in the final 20-Year Outlook report.</p> <p><u>Grid-Enhancing Technologies (GETs) Need to be Fully Evaluated and Reported</u></p> <p>BAMx applauds the CAISO for including the advanced conductors for the Greater Bay Area 500kV and 230kV line reconductoring upgrades in its evaluation of mitigation measures.[7] However, we did not notice consideration of any additional Grid-enhancing technologies (GETs) beyond advanced reconductoring, such as dynamic line ratings, power flow controllers, topology optimizations, etc. BAMx encourages the CAISO to include additional Grid-enhancing technologies (GETs) as potential alternatives and explain why they were rejected relative to the proposed mitigation measures in the final 20-Year Outlook report.</p>	<p>The Collinsville 230 kV Reactor project approved in the 2023-2024 TPP addresses the overload on the Collinsville – Pittsburg lines, and is modelled in the starting base cases for the 20-year outlook study.</p> <p>Thank you for your comment. The 20-year transmission outlook analysis focuses on a high level assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis on different alternatives including all the various applications of Grid Enhancing Technologies will be performed as part of the Tariff-based 10-year transmission planning process and the optimum solution will be recommended for approval.</p>
1D	California Public Utilities Commission	<p>Staff of the California Public Utilities Commission’s Energy Division (CPUC Staff or Staff) develop and administer energy policy and programs to serve the public interest, advise the CPUC, and ensure compliance with CPUC decisions and statutory mandates. The CPUC Energy Division Staff provide objective and expert analyses that promote reliable, safe, and environmentally sound energy services at just and reasonable rates for the people of California¹. Further, CPUC Staff advocate on behalf of California ratepayers at the Federal Energy Regulatory Commission (FERC), under whose jurisdiction CAISO transmission planning falls.</p>	

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>CPUC Staff appreciate this opportunity to request clarification on the cost estimates for each of the four alternatives presented for transmission related to Offshore Wind projects on the north coast and other per-unit cost estimates.</p> <p><u>Transmission Cost Estimates Related to Offshore Wind Interconnection</u></p> <p>Energy Division Staff appreciate the CAISO's efforts to update its 20-Year Transmission Outlook. In its presentation on April 18, 2024, the CAISO identified three buckets of projects needed to meet the transmission needs related to SB100:</p> <ol style="list-style-type: none"> 1. Mitigation Measures (upgrades on the existing CAISO footprint), 2. Out of State Wind Interconnection, 3. and Offshore Wind (OSW) Interconnection. <p>The CAISO described the anticipated Mitigation Measures with a high-end estimate of approximately \$4 billion, as well as transmission related to Out of State Wind Interconnection with a high-end estimate of approximately \$16 billion.</p> <p>For scenarios related to north coast OSW Interconnection, however, the CAISO presented numerous potential approaches, demonstrating the uncertainty related to the transmission development needed for this resource. CAISO explained that, unlike the north coast OSW, the central coast offshore wind will demand relatively few transmission upgrades for interconnection. The CAISO showed on slides 45 – 47 and explained on slides 48 and 49 that, "Four transmission alternatives for integration of north cost offshore wind are considered based on:</p>	<p>Thank you for your comment</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<ul style="list-style-type: none"> • Interconnection of one subsea HVDC to Moss Landing or both going to Bay Hub • Interconnection of one 500 kV AC line from Fern Road going to Del Norte or both going to Humboldt” <p>Slides 48 and 49 also included tables that appear to combine all costs of all project components for all four alternatives, making it very difficult to determine the components and costs for each of the four alternatives identified.</p> <p>CPUC Staff request that the CAISO provide cost estimate tables for each of the four identified alternatives to enable stakeholders and ratepayers to understand the estimated costs of each of the transmission alternatives related to north coast OSW.</p>	<p>The overall cost of each transmission concept will be included in the final 20-year outlook.</p>
1E	California Public Utilities Commission - Public Advocates Office	<p>The Public Advocates Office at the California Public Utilities Commission (Cal Advocates) provides these comments on the California Independent System Operator’s (CAISO) April 18, 2024, 20-Year Transmission Outlook presentation. Cal Advocates is an independent ratepayer advocate with a mandate to obtain the lowest possible rates for utility services, consistent with reliable and safe service levels and the state’s environmental goals.[1]</p> <p>Consideration of advanced conductors in the 20-Year Outlook update can support a least cost pathway for longer-term grid requirements.</p> <ol style="list-style-type: none"> 1. The CAISO should provide more information on the 46 observed thermal overloads under the 20-year scenarios and recommended mitigations to address these overloads. This information could assist stakeholders’ understanding of the viable project mitigations alternatives and ability to advocate for the least cost alternative for ratepayers. One such lower cost alternative could be reconductoring with advanced conductors. 	<p>Thank you for your comment. The 20-year transmission outlook analysis focuses on a high level assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis on different mitigation alternatives including all the various applications of Grid Enhancing Technologies will be performed as part of the Tariff-based 10-year transmission planning process and the optimum solution will be recommended for approval.</p>

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		<p>During the April 18, 2024 presentation, CAISO listed 46 areas on the grid that would experience thermal overloads under at least one of the CAISO 20-Year Transmission Outlook generation scenarios. However, CAISO only presented project mitigations for six of these areas.^[2] CAISO should provide analysis for the other 40 areas and any necessary project mitigations. Cal Advocates recommends that CAISO provide more information as described below:</p> <ul style="list-style-type: none"> a. Provide more information on the 46 identified overloads, such as the power flow results which provide the amount of overload expected and under which 20-year scenario (like in the January 4, 2024, meeting).^[3] b. Provide information on its proposed mitigation recommendation to address all 46 identified overloads. c. Consider reconductoring existing lines with advance conductors and Grid Enhancing Technologies (GETs) to address all 46 identified overloads under the 20-year scenarios. d. Provide information on the transmission capacity increases expected with line reconductoring with advanced conductors to address overloads where reconductoring is the proposed mitigation measure. CAISO should also provide information on transmission capacity increases that occur throughout the deployment of GETs to address all 46 identified overloads. This type of information should also be included in the transmission capacity estimates that CAISO provides to the California Public Utilities Commission (CPUC) in its Integrated Resource Planning proceeding. It would assist with providing more granular transmission capacity upgrade options that can help in selecting future resource procurement that has the lowest total costs. <p>Cal Advocates requests the above information to facilitate stakeholder input into the proposed projects and any alternatives given. The amount of overload expected could render certain</p>	

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		<p>alternatives unviable (e.g., advanced conductors). Information on the proposed mitigation recommendations could specify if the overload requires mitigation and which projects could be viable to mitigate the overload. Considering GETs could be an additional alternative to address all 46 identified overloads, potentially without the construction of new transmission lines or other costly mitigation projects. More information regarding the transmission capacity increases that is supplied to the CPUC could assist in selecting future resource procurement that has the lowest total costs.</p> <p>2. Reconductoring with advanced conductors or GETs could result in lower cost to ratepayers. As such, Cal Advocates requests the CAISO confirm whether it considered reconductoring with advanced conductors or GETs for the following three presented projects:</p> <p><u>Manning – Los Banos – Tracy 500 kV Line Project</u>: CAISO stated that the Los Banos – Tracy, Los Banos – Tesla and Los Banos – Manning 500 kV Lines will experience overloads under one of the 20-year scenarios and recommends building a new 500 kV line from Manning to Los Banos to Tracy 500 kV Status for \$0.5 to \$0.8 billion. CAISO should confirm if it considered reconductoring the mentioned lines with advanced conductors or GETs to address the mentioned overloads.</p> <p><u>Manning – Moss Landing 500 kV Line</u>: CAISO determined that the Moss Landing – Las Aguias 230 kV lines and Panoche – Las Aguias 230 kV lines will experience overloads with one of the 20-year scenarios and recommends building a new 70 mile 500 kV line from Maning to Moss Landing 500 kV Substation. The estimated costs for this new line are between \$0.38 and 0.5 billion. CAISO should confirm if it considered reconductoring the mentioned lines with advanced conductors or GETs to address the mentioned overloads.</p>	

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		<p><u>Loop in Midway – Manning 500 kV line to Gates Add Series compensation to Gates – Los Banos #3</u>: CAISO states that the Gates-Manning 500 kV Line is expected to overload under one of the 20-year scenarios and recommends (1) a loop-in the Midway – Manning 500 kV line into Gates Substation (2) series capacitors on the Gates – Los Banos 500 kv lines. CAISO should confirm whether it considered GETs to address the observed overload.</p> <p>3. Cal Advocates requests CAISO provide the costs for all the project alternatives identified.</p> <p>Cal Advocates recommends that cost information for the projects listed below also be provided. Cost estimates for all the project alternatives identified could assist in stakeholders’ evaluation of lower cost project alternatives and participation in stakeholder engagement meetings.</p> <p><u>Tesla-Metcalf</u></p> <p>CAISO provided the cost estimate for the proposed second 500 kV line but not for the other proposed alternative, which is reconductoring 36 miles of the Tesla-Metcalf 500 kV line project</p> <p><u>Tesla-Metcalf, Round Mountain-Cottonwood, Table Mountain-Palermo</u></p> <p>Cal Advocates supports the CAISO in considering advanced conductors for three of the projects presented in the 20-Year Transmission Outlook.[4] Advanced conductors have the potential to double existing transmission capacity at roughly one-third of the cost of building new lines in a much shorter timeframe.[5],[6],[7] Despite this cost advantage, CAISO only presented three projects that involve new 500 kV lines or other wire solutions and did not discuss whether reconductoring could have been an options or the deployment of a grid enhancing technology.</p>	<p>The overall cost of each transmission concept will be included in the final 20-year outlook.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
1F	CEERT and LEAP	<p>CEERT and LEAP appreciate the CAISO's leadership in preparing the 20-Year Transmission Outlook Update. This Update is very informative and helpful in guiding the iterative resource planning process used in California. The CAISO staff presentation on April 18 was very clear in its articulation of the challenges facing resource planners and energy policymakers in making the transition to a net zero carbon future in California's economy.</p> <p>CEERT and LEAP are particularly pleased to see the emphasis in the Update on the need to plan for the expected retirement of a significant portion of the state's aging fleet of gas-fired power plants. Clearly, an expanded transmission system is a key part of the solution in reducing the combustion of natural gas in major population centers of the state.</p> <p>Transmission Upgrades in the Greater Bay Area</p> <p>The 20-Year Transmission Outlook Update identifies numerous transmission mitigation measures that are needed in the Greater Bay Area. The Update states that 11 500/230 kV transformers will be overloaded and may need to be replaced. Also, 238 miles of 230 kV lines that will need to be reconductored with advanced conductors. Furthermore, the CAISO has identified the need to conduct more detailed studies of 230/115 kV transformers and 115 kV lines that also may need upgrades. CEERT and LEAP recommend that the studies for additional upgrades in the Bay Area begin immediately.</p> <p>The magnitude of effort that is required to mitigate transmission system overloads in the Greater Bay Area is so great that it suggests a need to develop an actionable near-term plan for the engineering design, equipment procurement and construction scheduling for these projects so that the required work be completed in a reasonable time period. The need is particularly urgent given the backlog in orders for transformers and other electrical equipment across the United States.</p>	<p>Thank you for your comment</p> <p>The 20-year transmission outlook analysis focuses on a high level assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis on different mitigation alternatives including all the various applications of Grid Enhancing Technologies will be performed as part of the Tariff-based 10-year transmission planning process and the optimum solution will be recommended for approval.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>Central Valley Transmission Projects</p> <p>CEERT and LEAP commented in the 2023-2024 Transmission Plan that congestion continues to increase on Path 15 as new clean energy resources are added in Southern California and the Central Valley. Increasing congestion points to future reliability problems. The 20-Year Outlook Update confirms that this trend will result in serious overloads on Path 15 and on transmission to the Moss Land and Metcalf substations as clean energy resources get built out to meet the 2045 resource portfolio.</p> <p>CEERT and LEAP want to highlight the finding that four major 500 kV transmission projects need to be built along Path 15 as quickly as possible. Those projects are: 1) a new Tesla – Metcalf 500 kV line, 2) a new Manning – Moss Landing 500 kV line, 3) a new Manning – Los Banos – Tracy 500 kV line, and 4) looping the Midway – Manning 500 kV line into the Gates substation or a new 500 kV substation. CEERT encourages the CAISO to work with the Balancing Area of Northern California and the Western Area Power Administration in planning and authorizing these needed transmission projects. The CAISO should also explore the opportunity to use its subscriber participating transmission owner model to encourage innovative finance and expedited development of these projects.</p> <p>Transmission for Out-of-State Wind</p> <p>CEERT and LEAP are pleased to note that the 20-Year Outlook Update is encouraging the consideration of transmission projects that would terminate at locations within the CAISO footprint such as the Tesla and Lugo substations. Developing transmission to the Lugo substation is particularly promising and can build on previous CAISO planning that has evaluated alternative upgrades from Kramer substation to the Lugo substation and from the Mead substation to the Adelanto substation.</p> <p>CEERT and LEAP encourage the CAISO to work together with the Los Angeles Department of Water and Power and the</p>	<p>Thank you for your comment</p> <p>Thank you for your comment. The transmission concepts considered in the 20-year outlook will be an input into future TPP cycles. More detailed and comprehensive analysis performed as part of the Tariff-based annual 10-year TPP will provide more information on the need year and the optimum solution that will be recommended for approval.</p> <p>Thank you for your comment</p> <p>Thank you for your comment</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>Western Area Power Administration in considering transmission solutions that meet the transmission needs for all three entities. CEERT and LEAP are aware of multi-state transmission that could deliver energy from out-of-state wind and geothermal projects to the Control substation near the California-Nevada border. The CAISO and Southern California Edison should study how the Ivanpah – Control transmission project can be leveraged to enable the delivery of more out-of-state wind and geothermal energy.</p>	
1G	City of San Jose	No comment	
1H	Defenders of Wildlife	<p>Land use and environmental implications of transmission siting choices directly affect project cost and viability. A new build transmission line that avoids or minimizes adverse impacts to communities, land uses, natural resources, and tribal resources reduces project costs and increases project viability. The land use and environmental implications of new transmission builds must be considered when evaluating the proposed mitigation measures and should be done before entering the permitting and environmental process. This proactive planning and design can streamline the permitting and environmental review of the selected project and failure to do so puts the project at risk of failure due to poor siting.</p> <p>We recommend utilizing the California Energy Commission's (CEC) <u>Land Use Screens for Electrical System Planning tool</u> to compare the land use and environmental implications for any new build mitigation. The CEC Land Use Screens are already used in the California Public Utilities Commission's Integrated Resource Planning and the Senate Bill 100 implementation. Using the CEC Land Use Screens for the 20-Year Outlook process will bring consistency across the multiple statewide energy planning efforts. This level of analysis should inform the consideration of mitigation options to help select the least conflict solution. We offer the following recommendations on identified mitigation options:</p> <p><i>Tesla – Metcalf 500 kV Line</i></p>	Thank you for your comment

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>Is the second proposed line expected to be within the same right of way? If not, the environmental and land use implications should be evaluated compared to advanced reconductoring of the existing line.</p> <p><i>Manning – Los Banos – Tracy 500 kV Line</i></p> <p><i>Manning – Moss Landing 500 kV Line</i></p> <p>The land use and environmental implications of any proposed route of the new lines need to be evaluated before selecting the mitigation solution(s).</p> <p><i>Out-of-State Wind (OOS)</i></p> <p>As correctly noted by Avangrid Renewables in their January 18, 2024 comments:</p> <p style="padding-left: 40px;">"Permitting more than 100 miles of additional new transmission through California to reach interconnection points deeper within the CAISO system closer to load would add significant cost, risk, and complexity to these potential new transmission projects, which already face a long and complex permitting process."</p> <p>Any consideration of new transmission to deliver OOS wind or other OOS energy resources must consider permitting feasibility, and that cannot be done without considering land use and the environmental implications of the proposed transmission. Utilization of existing rights of way to reach load centers can help reduce potential conflicts and should be prioritized.</p> <p><i>Offshore Wind</i></p> <p>We recognize that there are no optimal solutions for North Coast offshore wind. However, new 500 kV lines from the North Coast</p>	

No	Submitting Organization	Comment Submitted	CAISO Response
		to Fern Road or Collinsville would traverse some of California's most explosively fire-prone areas. Given the well documented relationship between transmission lines and wildfire, we question the appropriateness and viability of these lines. These lines would also cross some of California's richest biodiversity zones and require extensive and expensive mitigation. We urge caution in considering these solutions. Any route selection should be guided and informed by the CEC Land Use Screening tool to enable informed decision-making.	
1I	Fervo Energy Company	Fervo Energy Company ("Fervo") appreciates the opportunity to provide its comments on the California ISO's ("CAISO") 20-Year Transmission Outlook Update. We especially appreciate the CAISO's study of mitigation measures including those to assess different pathways to integrate resources from out of state onto the CAISO grid such as clean firm geothermal. This forward-looking analysis will assist in shaping an energy transition that achieves SB100, maintains reliability, and builds resilience.	Thank you for your comment
1J	Invenergy	No comment	
1K	LSA	<p>The Large-scale Solar Association (LSA) appreciates CAISO's forward-looking 20-Year Outlook analysis. This initiative provides an opportunity for CAISO to explore future scenarios that extend beyond the regular Transmission Planning Process (TPP) horizon. The results inform the selection of "least regrets" mitigations in the TPP process and establish a roadmap that helps stakeholders plan future resource investments. LSA provides the following suggestions to improve the process.</p> <p style="padding-left: 40px;">A. Identify Upgrades Needed in a Low Offshore Wind Scenario</p> <p>LSA recommends that CAISO use the 20-Year Outlook to identify what upgrades are needed in a low offshore wind scenario. The April 18th 20-Year Transmission Outlook Update presentation shows that many of the upgrades in the PG&E Fresno area are triggered under "low wind" scenarios (see slides 37 – 39) but it is unclear whether offshore wind is a factor in this assessment. CAISO should provide more information about how low offshore wind scenarios impact the identified</p>	<p>Thank you for your comments.</p> <p>In the low wind generation scenario, the generation coming from offshore and out of state wind plants are assumed to be at zero with small amounts of onshore wind generation in California. Battery Energy Storage Systems (BESS) were assumed to supply a significant portion of the load in that scenario.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>mitigations. This could include details about how the upgrades identified for offshore wind can be utilized cost-effectively in low offshore wind scenarios or details about what alternative upgrades would be needed to support higher volumes of solar, onshore wind and storage in low offshore wind scenarios.</p> <p>In addition, considering the uncertainties, high costs and long lead-times inherent in developing new offshore wind, CAISO has an obligation to establish a contingency plan to protect ratepayers from the risk of building transmission assets that could become stranded if offshore wind does not materialize as expected. LSA recommends that CAISO use the 20-Year Outlook to explore the possibility of establishing construction offramps for approved offshore wind upgrades to limit losses if the CPUC reduces the volume of offshore wind in future resource plans or if it otherwise becomes clear between planning cycles that specific offshore wind resources will not come to fruition as anticipated. If CAISO approves upgrades for offshore wind and proceeds to the normal TPP Phase 3 competitive solicitation process, it will select a project sponsor who would then initiate the development process. LSA recommends that CAISO establish a schedule of offramps during the construction process (e.g. at the end of design engineering and just before construction or ordering long-lead-time equipment), for potential course corrections and to give CAISO an opportunity to confirm whether the approved capacity can be used for other purposes.</p> <p style="padding-left: 40px;">B. Identify Upgrades That CAISO Will Withhold for Specific Resource Types</p> <p>CAISO has the authority to withhold transmission capacity built for specific resources that meet certain criteria (e.g. location constrained or long lead-time resources). LSA urges CAISO to use the 20-Year Outlook to clarify when and how it might exercise this authority and what the impact might be to other resources. For example, the April 18th 20-Year Transmission Outlook Update presentation indicates that the Trout Canyon –</p>	<p>The 20-year outlook study was performed on one resource portfolio provided by CPUC that included 20,000 MW offshore wind and 69,640 MW of utility scale solar among other resources. Studying a different portfolio was beyond the scope of the 20-year outlook.</p> <p>Approval of transmission projects and managing their detail implementation is beyond the scope of the 20-year outlook analysis. The 2023-2024 Transmission Plan includes measures to ensure coordination of offshore wind resource and the required transmission project implementation.</p> <p>Such details are beyond the scope of the 20-year outlook and are discussed in the tariff-based annual transmission planning process.</p>

No	Submitting Organization	Comment Submitted	CAISO Response												
		<p>Lugo upgrade would be required as a mitigation measure to accommodate Wyoming wind (slide 41). This upgrade is in an area of the grid that also serves significant volumes of solar resources. CAISO should clarify that associating the Trout-Canyon – Lugo upgrade with Wyoming wind does not give those resources priority over solar resources in the area. In general, CAISO should provide more clarity about when it may exercise its authority to reserve capacity and, most importantly, how it might impact other resources.</p>													
1L	Pacific Gas & Electric	<p>Pacific Gas and Electric Company (“PG&E”) commends the CAISO on its draft update of the 20-Year Transmission Outlook (“20-Year Outlook Update”). PG&E considers this recurring effort as highly valuable for policymakers, planners, and stakeholders as the State moves towards a clean energy future. While PG&E considers the draft 20-Year Outlook Update as a good reference in showing the longer-term transmission needed to reliably meet the State’s clean energy goals, PG&E offers the following suggestion that should be considered as CAISO evaluates the feasibility of bringing in new power sources to several locations in PG&E’s service area.</p> <p>1. Short circuit duty studies will need to be performed to determine if the addition of the new 500 kV upgrades will drive fault duties to values greater than 63 kA on both the 500 kV and 230 kV stations. PG&E’s Interconnection Handbook lists the following stations that cannot accept new Point of Interconnection’s (POI’s) based on short circuit limitations:</p> <table border="1" data-bbox="579 1211 1173 1468"> <tbody> <tr> <td>Midway 500 kV</td> <td>Tesla 500 kV</td> </tr> <tr> <td>Midway 230 kV</td> <td>Tesla 230 kV</td> </tr> <tr> <td>Midway 115 kV</td> <td>Tesla 115 kV</td> </tr> <tr> <td>Metcalf 115 kV</td> <td>Newark 230 kV</td> </tr> <tr> <td>Metcalf 230 kV</td> <td>Newark 115 kV</td> </tr> <tr> <td>Pittsburg 230 kV</td> <td>Pittsburg 115 kV</td> </tr> </tbody> </table>	Midway 500 kV	Tesla 500 kV	Midway 230 kV	Tesla 230 kV	Midway 115 kV	Tesla 115 kV	Metcalf 115 kV	Newark 230 kV	Metcalf 230 kV	Newark 115 kV	Pittsburg 230 kV	Pittsburg 115 kV	<p>Thank you for your comments.</p> <p>The 20-year transmission outlook analysis focuses on a high level assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis to identify other potential system needs related to short circuit duty, voltage, and transient stability, and associated mitigation alternatives will be performed as part of the Tariff-based 10-year transmission planning process and the optimum solution will be recommended for approval.</p>
Midway 500 kV	Tesla 500 kV														
Midway 230 kV	Tesla 230 kV														
Midway 115 kV	Tesla 115 kV														
Metcalf 115 kV	Newark 230 kV														
Metcalf 230 kV	Newark 115 kV														
Pittsburg 230 kV	Pittsburg 115 kV														

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>While this list is based on the generators in queue (GIDAP process), assumptions will have to be made as to how the 20-Year Outlook upgrades will be inserted into the queue or not for fault duty impacts. Short circuit parameters will be required for the proposed inverter-based resources and HVDC lines.</p> <p>In addition PG&E would also like to request that the CAISO post the base cases that were used for the 20-Year Outlook Update study including the epc/change files for the proposed upgrades.</p>	<p>(Option 1 for answer) Base cases for the Tariff-based annual transmission planning process get posted on the CAISO's market participant portal. The high level assessment in the 20-year outlook informational study is performed on system models developed with number of simplifying assumptions and solutions methods to gain an insight into the required enhancements. Therefore CAISO's current practice is not to post such simplified system models on the CAISO's MPP.</p> <p>(Option 2 for answer) CAISO's current practice is not to post base cases developed for the 20-year outlook studies.</p>
1M	RWE Renewables	No comment	

2. Please provide any additional comments your organization has on the 20-Year Transmission Outlook

No	Submitting Organization	Comment Submitted	CAISO Response
2A	ACP-California	<p>ACP-California reiterates its appreciation for CAISO's work on the 20-Year Outlook Update. As the information from the 20-Year Outlook becomes more integrated into the resource and transmission planning processes, we hope the 20-Year Outlook can continue to inform other actionable processes by the CAISO, the CPUC and the CEC. It is important to note that many of the transmission expansions that are needed, to integrate in-state resources, out-of-state resources, and offshore resource alike, must move toward approval in the TPP quickly if they are going to be in-service, and capable of supporting the state's needs, by 2045. We therefore urge CAISO to continue and expand its proactive efforts on transmission planning and coordination with the CPUC and CEC to take action on the transmission required to meet the state's 2045 needs.</p>	<p>Thank you for your comments. The 20-year transmission outlook analysis focuses on the technical assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis will be performed as part of the Tariff-based 10-year transmission planning process and the optimum solutions will be recommended for approval. Such detailed analysis will be performed in coordination with state agencies.</p>
		<p>As noted in prior comments, we recognize that the resource portfolios that CAISO has analyzed for the 20-Year Outlook Update, including the amounts and location of offshore wind resources, were provided by the CEC, with input from and coordination with the CPUC, and, thus, CAISO is not responsible for making modifications to these portfolios. Nevertheless, it is important to note that the offshore wind assumptions used in the 20-Year Outlook may not accurately reflect the correct geographic representation of the anticipated build-out of this resource and are not fully reflective of the state's offshore wind planning goals in the 2045 timeframe.</p>	<p>Thank you for your comment</p>
		<p>First, we reiterate our point from prior comments that the offshore wind capacity assumed in the 20-Year Outlook for 2045 (20 GW) is lower than the high-end of CEC's own planning goal of 25 GW of offshore wind by 2045.^[1] Therefore, the portfolio of offshore wind resources being planned for in the 20-Year Outlook Update, is insufficient to meet the state's own offshore wind planning goals. ACP-California strongly advocates for future planning efforts to appropriately plan for the full 25 GW of offshore wind by 2045 to ensure the state can ultimately achieve its offshore wind goals and achieve needed resource diversity. In</p>	<p>Thanks you for your comment</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>future efforts, we encourage the CEC and CPUC to update the resource portfolios now to ensure that the assumed capacity of offshore wind is in line with the state's 2045 planning goals. In doing so, however, the buildout capacity assumed for other resource types should not be reduced from the levels currently contained in the 2045 portfolios. In other words, planning to the full 25 GW of offshore wind resources must not come at the expense of upgrades needed to support clean capacity elsewhere on the system. ACP-California recommends that the CEC/CPUC portfolio used for future 20-Year Outlooks incorporate a "buffer" (e.g., 5 GW of additional offshore wind resources) to account for factors such as higher load growth and transmission project delays that consistently lead long-term planning efforts to undershoot the required transmission buildout, and true up the assumptions through the TPP.</p> <p>Additionally, ACP-California continues to be concerned that the geographic distribution of the offshore wind resources in the 20-Year Outlook Update, the 2023-24 Base Case and Sensitivity case systematically underrepresents the amount of offshore wind capacity that will be built in the central coast. When the IRP portfolios were developed for use in the 2023-24 TPP, they included estimates of offshore wind capacity at the Morro Bay and Humboldt lease areas that we now know to underestimate the capacity potential in these zones given trends in technology development and layout design. Leaseholders now estimate that the capacities in Morro Bay will be at least 6,000 MW.¹²¹ The buildout in the Morro Bay area could, therefore, easily exceed the highest end assumed in any of the studies that will be performed as part of the 2023-24 TPP or the 20-Year Outlook. As currently designed, these studies never assess more than 5,400 MW in the central coast. To assess the transmission needs for higher amounts of offshore wind near Morro Bay, ACP-California supports CAISO considering the three potential transmission alternatives to interconnect offshore wind in the central coast. Similar to the Central Coast, the capacity proposed for Humboldt offshore wind development is too low, at 2,700 MW. This quantity should be revised up to 3,600 MW,</p>	<p>Thank you for your comment.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>reflecting a 7 MW/km² density factor. Again, ACP-California recognizes that these buildout assumptions were provided to the CAISO by the CEC, in coordination with the CPUC, but we encourage the state agencies and CAISO to explore more significant buildout of offshore wind resources in the central coast and the north coast for future planning efforts.</p> <p>Finally, ACP-California highlights that the 20-Year Outlook Update represents a significant shift in California's generation mix with the assumed retirement of 15,000 MW of natural gas fired generation. The retirement of natural gas resources will require a diverse mix of replacement resources, including clean firm resources, like geothermal, and diverse out-of-state and offshore wind to complement the in-state clean energy resources. All of these resources are likely to require additional transmission build-out and we ask that CAISO continue to evaluate how to incorporate diverse and firm renewable resources into its planning exercises and pay close attention to the needs within the state and the build out required to fully deliver out-of-state resources (such as wind and geothermal) to CAISO load.</p>	<p>Thank you for your comment.</p>
2B	Avangrid Renewables	<p>Avangrid supports the inclusion of out of state wind resources in CAISO's plan and believes that building new transmission to import incremental out of state wind resources is a cost effective and feasible addition to California's generation mix that will allow the state to reach long term energy goals. High-capacity factor out of state resources, even after the necessary transmission buildout, can bring complementary benefits to the existing system such as regional diversity and clean generation at times of peak needs. The level of out of state wind resources being studied are reasonable and aligned with the results of the CPUC's IRP process.</p> <p>As a transmission developer, Avangrid recommends that the CAISO consider siting and permitting feasibility in addition to cost when considering potential interconnection points for new transmission to import out of state wind. This consideration should be made when determining where this new transmission</p>	<p>Thank you for your comment.</p> <p>The 20-year transmission outlook analysis focuses on the technical assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis will be performed as part of the Tariff-based 10-year transmission planning</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>for out of state wind should interconnect, whether that is at the CAISO border or at interconnection points within the CAISO system that are closer to load. Along with cost and reliability considerations, the CAISO must also consider the impacts of potential delays to the resource buildout required to decarbonize California's energy supply within the timeline mandated by the state legislature. Taking feedback from developers and other parties regarding the feasibility of interconnection to points either on the CAISO border or within the CAISO system will help to prioritize interconnection options for out of state wind in the 20-year plan. This input could include the use of technologies to reduce the impact that new transmission lines would have to highly congested paths, such as the use of HVDC technology.</p> <p>CAISO is considering interconnection locations for incremental New Mexico wind imports to Palo Verde or Lugo, but Palo Verde may not be the most feasible or cost-effective location to interconnect new transmission due to the lack of headroom on the existing transmission system and siting / permitting considerations in Arizona. To deliver incremental New Mexico wind to CAISO at Palo Verde, new transmission would need to be routed through the densely populated metropolitan areas of Southern Arizona, as there is not sufficient headroom on the existing transmission system to wheel the energy from East of Phoenix to the CAISO system as is the case with the energy imported to the CAISO from the SunZia transmission project. Any new transmission built to deliver New Mexico wind to California would need to be permitted and built through Arizona for the benefit of California, so minimizing the impacts of this new transmission to Arizona should be considered in the CAISO's planning processes.</p> <p>The most direct and least impactful route for this new transmission is likely through the less constrained transmission corridors of northern / central Arizona, which would require the incremental New Mexico wind imports to be delivered to interconnection points further north. For these reasons, Avangrid recommends that CAISO study incremental New</p>	<p>process and the optimum solutions will be recommended for approval. Such detailed analysis will be performed in coordination with state agencies and takes into account permitting feasibility.</p> <p>Thank you for your comment</p> <p>Thank you for your comment and for highlighting the potential challenges of new interconnections to Palo Verde. Given that the 20-year outlook study identified overloads on the Eldorado – Lugo path with the interconnection of just Wyoming wind at Eldorado, connecting New Mexico wind to Eldorado will make the overloads more severe. Therefore interconnecting the out-of-state wind to</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>Mexico wind interconnection at the Eldorado substation in Nevada instead of Palo Verde for substations located outside of the physical border of California. Since CAISO is also proposing an interconnection analysis for New Mexico wind at Lugo, a northern transmission pathway to Eldorado would provide a more distinct alternative routing study.</p> <p>When considering whether new transmission for importing out of state wind should interconnect at the CAISO border or at interconnection points deeper within the CAISO system, CAISO should take into consideration multiple aspects that will have an impact in the viability of out of state wind resources:</p> <ul style="list-style-type: none"> • Any new transmission project built to deliver out of state wind from New Mexico, Wyoming or Idaho to the CAISO market would need to complete a multi-state permitting process in at least two states outside of California. Permitting more than 100 miles of additional new transmission through California to reach interconnection points deeper within the CAISO system closer to load would add significant cost, risk, and complexity to these potential new transmission projects, which already face a long and complex permitting process. • It will be challenging from a permitting perspective to build new transmission through California to interconnection points that are closer to load centers within the CAISO system such as those being considered in this initiative for the Lugo substation. CAISO should take stakeholder feedback on permitting considerations into account when planning for which interconnection points for out of state wind resources are optimal. While Avangrid is not opposed to the CAISO plan to study both an out of state and in state interconnection location for New Mexico wind, the study should reflect that issues beyond just cost must be taken into consideration when determining the preferred interconnection 	<p>substations further inside CAISO system such as Lugo, Devers, Tesla and potentially others could be considered in future detailed studies.</p> <p>Thank you for your comments. As indicated earlier, many additional factors including permitting challenges will be considered in future Tariff-based TPP cycles before a transmission project is recommended for approval.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>location. Having an interconnection study to Lugo and an interconnection study to Eldorado would cover a wider range of transmission siting options when compared to interconnecting at both Lugo and Palo Verde.</p>	
2C	Bay Area Municipal Transmission Group (BAMx)	No comment	
2D	California Public Utilities Commission	<p>Comments on the Per Unit Cost Estimates</p> <p>CPUC Staff appreciate the CAISO's efforts to estimate per unit costs for the transmission development described in the 20-year Transmission Outlook. In the presentation at the April 18th 20-year Transmission Outlook meeting, the CAISO provided a Per Unit Cost Estimate (Slide 32) for several types of transmission infrastructure - primarily 230 kV and 500 kV assets. It appears that some cost estimates included in the April 18th presentation deviate significantly from those included in the 2023 Participating Transmission Owner Interconnection Per Unit Costs Guides (IPUCG). CPUC Staff request that the CAISO describe in detail its methodology for determining the estimated per unit costs for the high voltage assets included in the 20-year Transmission Outlook.</p>	<p>CAISO reviewed number of references in developing the per unit costs used in the 20-year outlook, including the information for per unit cost used in the GIP process, the cost of projects in the request window submissions, the recent study completed by CEC on northern California and Southern Oregon Offshore Wind Transmission studies, and consultations with original equipment manufacturers. CAISO's assessment indicates that the range of the per unit costs are adequate to provide a high level insight into cost estimates of the project considered in the 20-year outlook study. If any of the projects is to be considered in future TPP cycles, a more detailed cost estimate will be developed for that specific project.</p>
2E	California Public Utilities Commission - Public Advocates Office	<p>CAISO should seek alignment of Offshore Wind (OSW) interconnection and transmission alternatives with other planning efforts to the greatest extent possible.</p> <p>Multiple coordination and planning efforts are underway across federal, state, and local agencies and a wide variety of stakeholders to develop OSW resources off the California coast. Alignment between planning initiatives wherever possible helps stakeholders contribute informed and meaningful input to ensure the most efficient and cost-effective strategies for OSW development are implemented. The CAISO should identify the source of the technical project design and cost components included in option A and B project concepts and the floating offshore high voltage direct current (HVDC) transmission technology concept.^[1] Specifically, CAISO should address</p>	<p>Thank you for your comment. Please refer to the response to comment 2D above.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>which project components are in accordance with the direction of Assembly Bill (AB) 525 (AB 525, Chiu, Chapter 231, Statues 2021).</p> <p>The AB 525 OSW Strategic Plan (AB 525 Plan) presents five transmission alternatives that are needed to meet different levels of OSW development in the North Coast.[2] Out of the five alternatives considered in the AB 525 Plan, only Alternative 25.8a considers a development scenario similar to the 20-Year Transmission Outlook update where over 14 GW of North Coast OSW interconnects to the onshore transmission system.[3] In addition, Alternative 25.8a includes 9.8 GW generated in the Oregon call area.</p> <p>Alternatives considered in CAISO's 20-year Transmission Outlook update have significant discrepancies with the alternatives in the AB 525 Plan. These discrepancies need clarification, including an explanation of any difference in project components and their costs. For example, the AB 525 Plan Alternative 25.8a proposes two HVDC lines between Cape Mendocino and Humboldt and states highly difficult feasibility for an undersea pathway connecting Cape Mendocino to Humboldt. Whereas the 20-Year Transmission Outlook update concepts suggest one HVDC line between Cape Mendocino and Humboldt that extends 250 miles. The CAISO should explain any discrepancies and impacts on project costs in the alternatives provided in the 20-Year Outlook update with project alternatives under consideration in the AB 525 Plan.</p> <p>Additionally, CAISO should note any project concepts or cost components that are materially different from planning initiatives or studies considered in AB 525. While it is inevitable that reports and findings will continually evolve with the most up to date information, there should be consistency and transparency between the various plan documents surrounding California OSW development</p>	<p>CAISO participates in many studies and conferences discussing the transmission projects required for integration of offshore wind resources in the Pacific Ocean near west coast, including the studies performed as part of the AB 525 OSW Strategic Plan.</p> <p>Due to significant difficulty in implementation of subsea HVDC cable between Cape Mendocino and Humboldt, identified in the AB 525 Strategic Plan, CAISO considered to have only one subsea HVDC connection instead of two proposed in the AB 525 Plan. The reason for the length of the cable are the environmental challenges to build subsea cable near shore.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>Cal Advocates requests clarification and greater information on the cost components of North Coast OSW interconnection.</p> <p>The CAISO should further explain the breakdown of the cost estimates for the 500 kV HVDC line to Collinsville as the cost range of this component is inconsistent with the New Humboldt 500 kV Substation and 500 kV line to Collinsville [HVDC operated as AC] project that was recommended for approval in the draft 2023-2024 Transmission Planning Process (TPP) Plan. In the 20-Year Transmission Outlook update, CAISO provides a range of costs for a 500 kV HVDC line to Collinsville from \$1,813 – \$2,590M.[4] CAISO provides a very similar price range for the new Humboldt 500 kV Substation and 500 kV line to Collinsville, from \$1,913M – \$2,740M.[5] CAISO should explain why the cost component for a single transmission line is almost equal to a project cost that includes a new substation and a single transmission line located on the same right-of-way.</p> <p>The CAISO should identify which OSW cost components apply to which North Coast OSW option. CAISO identifies two transmission concepts for connecting North Coast OSW (Option A and Option B)[6] and provides high level cost estimates for OSW Interconnection components.[7] The presentation of these options, however, does not identify which cost components will be necessary under which option. Additionally, the presentation does not explain how cost component estimates will change depending on which combination of alternatives is chosen in other areas. For example, the cost component for the 2 GW HVDC converter station is included for both the Del Norte Connection (\$2,400-\$4,800M for 6-8 stations) and the Cape Mendocino Connection (\$2,400 - \$3,600M for 6 stations),[8] but it is not indicated whether Option 1 or 2 of North Coast Connections is assumed for these high-level estimates. CAISO should indicate which cost components are applicable to which alternatives and options identified as viable OSW Interconnection solutions.</p>	<p>Most of the cost for the Humboldt – Collinsville project is the transmission line itself which is around 260 miles long. The cost of a 500 kV substation is a small portion of the overall cost estimate.</p> <p>The final report provides the overall cost estimate.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>Cal Advocates supports exploring the benefits of out-of-state (OOS) wind interconnection in the CAISO footprint.</p> <p>Cal Advocates supports the evaluation of multiple OOS wind interconnection points to find the most cost-effective way to import OOS wind. The CAISO has identified a potential benefit of interconnecting OOS wind to substations closer to the load centers in the CAISO system or extending transmission lines within the CAISO footprint (e.g., SunZia) rather than interconnecting OOS wind at the CAISO border.^[9]</p> <p>Cal Advocates requests clarification on transmission upgrade updates from the previous 20-Year Outlook.</p> <p>The CAISO should identify mitigation measures and projects that are proposed in the 2024 20-Year Transmission Outlook that replace or update mitigation measures and projects that were proposed in the 2022 20-Year Transmission Outlook. CAISO should identify the following projects:</p> <ul style="list-style-type: none"> • Projects included in the 2022 20-Year Transmission Outlook that were removed from the 2024 20-Year Transmission Outlook • Projects not included in the 2022 20-Year Transmission Outlook that were added to the 2024 20-Year Transmission Outlook • Projects included in the 2022 20-Year Transmission Outlook that were updated or replaced with an alternative project in the 2024 20-Year Transmission Outlook <p>Identifying these categories of projects would help summarize the differences in projects and mitigations needed to address the updated 2045 resource portfolio. Clarifying these updates would increase transparency about how the projects have changed</p>	<p>Thank you for your comment</p> <p>Thank you for your comment. A number of projects initially included in the 2022 20-Year Outlook were subsequently approved through the Transmission Planning Process in later years. Additional projects proposed in the 2024 Outlook are based on the projected amounts and locations of offshore wind and other resources identified in the resource portfolio.</p>

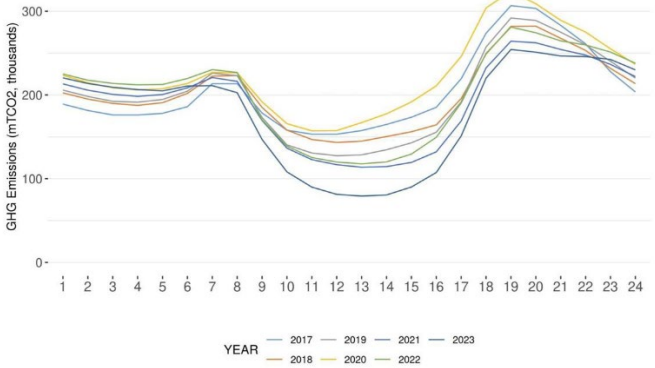
No	Submitting Organization	Comment Submitted	CAISO Response																																												
		over time and what changes have been made in long term transmission planning.																																													
2F	CEERT and LEAP	<p>CEERT and LEAP are pleased to see that the CAISO has incorporated into its modeling the locations of 4000 megawatts of Long-Duration Energy Storage and 5000 megawatts of Clean Firm Energy Resources in the 20-Year Transmission Outlook Update portfolio for 2045. It would be helpful to get further clarification from the CAISO or the CPUC as to how the busbar locations for these resources were chosen and what alternative locations were considered. The tables below reflect our understanding of the locations used in the 20-Year Transmission Outlook for the Clean Firm Resources and Long-Duration Storage Resources.</p> <p>Locations of Clean Firm Resources Modeled in the 20-Year Transmission Outlook</p> <table border="1" data-bbox="535 909 1218 1315"> <thead> <tr> <th>Substation</th> <th>Voltage</th> <th>Resource Area</th> <th>Capacity</th> </tr> </thead> <tbody> <tr> <td>Bellota</td> <td></td> <td>230 Central Valley LosBanos</td> <td>300</td> </tr> <tr> <td>Delevan</td> <td></td> <td>230 Northern CA</td> <td>150</td> </tr> <tr> <td>Diablo</td> <td></td> <td>500 PGE Greater Carrizo</td> <td>750</td> </tr> <tr> <td>Eight Mile</td> <td></td> <td>230 Central Valley LosBanos</td> <td>200</td> </tr> <tr> <td>Eldorado</td> <td></td> <td>230 Southern NV Desert</td> <td>500</td> </tr> <tr> <td>Gates</td> <td></td> <td>500 PGE Westlands Fresno</td> <td>750</td> </tr> <tr> <td>Humboldt (Proposed)</td> <td></td> <td>500 Northern CA</td> <td>1000</td> </tr> <tr> <td>Lugo</td> <td></td> <td>500 Greater Kramer</td> <td>600</td> </tr> <tr> <td>Vincent</td> <td></td> <td>230 Greater Tehachapi</td> <td>500</td> </tr> <tr> <td>Mendota</td> <td></td> <td>115 PGE Westlands Fresno</td> <td>250</td> </tr> </tbody> </table>	Substation	Voltage	Resource Area	Capacity	Bellota		230 Central Valley LosBanos	300	Delevan		230 Northern CA	150	Diablo		500 PGE Greater Carrizo	750	Eight Mile		230 Central Valley LosBanos	200	Eldorado		230 Southern NV Desert	500	Gates		500 PGE Westlands Fresno	750	Humboldt (Proposed)		500 Northern CA	1000	Lugo		500 Greater Kramer	600	Vincent		230 Greater Tehachapi	500	Mendota		115 PGE Westlands Fresno	250	<p>Thank you for your comment. The “Final 2045 Scenario Mapping Dashboard” on CEC website provides the mapping of the resources: https://efiling.energy.ca.gov/GetDocument.aspx?tn=251044&DocumentContentId=85982</p>
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2G	City of San Jose	<p>The City of San Jose commends CAISO for conducting a longer-term outlook to inform the 10-year action plan for transmission investment and executing that process in this 2023-2024 20-year Draft Outlook.</p> <p>While this year’s Draft Outlook rightly focuses on the policy-driven shift in new resource additions to transmission-poor areas (gen pockets) such as offshore and out-of-state wind, it is crucial to also address the required reliability-driven upgrades in one of the two major load pockets in the state—PG&E’s Greater Bay Area. The other major load pocket in the State (LA Basin) has recently been extensively analyzed for long-term transmission additions to allow the retirement of the Aliso Canyon natural gas storage facility. The City recommends a similar analysis be conducted for the Greater Bay Area.</p> <p>The Greater Bay Area will bear the brunt of the new energy flooding in from offshore wind and is highly likely to see above-average load growth. Additionally, entry points for new infrastructure are geographically constrained. This region already has relatively large local capacity requirements and is</p>	<p>Thank you for your comment.</p> <p>Several enhancements on the 500/230 kV transformers and the 230 kV lines are identified in the Greater Bay area in The 20-year outlook. Detail studies of the required 115 kV enhancements are beyond the scope of the 20-year outlook studies.</p>																																				

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		<p>slated for significant gas retirements in the long-term scenario. Since the standard reliability-driven analysis in the annual TPP process tends to be shorter than the full 10-12 years pending clarity on the specific granular local load forecast, there is a real need to step back and take a hard look at longer-term transmission needs in the Greater Bay Area. That analysis should be in this year's 20-year outlook.</p> <p>The large in-flight HVDC projects in San Jose appeared suddenly late in the 2021-2022 TPP. It was not mentioned in either the September or November stakeholder progress reports but appeared fully baked and recommended for approval in the January Draft TPP. The HVDC projects contemplate two Phases, and money is being spent in Phase 1 in anticipation of future approval of additional significant expansion in Phase 2. Yet, no publicly available analysis is available to prepare for surfacing Phase 2 of the project and any viable alternatives.</p> <p>It is too late to conduct the required analysis before the June release of the Final 20-year Outlook report. At least, CAISO should include a discussion and a plan in the June report. The City recommends that the CAISO commit to conducting an additional 20-year Outlook analysis of the transmission needs in the Greater Bay Area. That analysis should be published in August along with the already-in-flight 2024-2025 TPP preliminary reliability analysis for the GBA and publicly discussed in the scheduled September Stakeholder call.</p>	<p>The HVDC projects were outcome of the in-depth power flow and alternative analysis based on the assumptions and data available. The project scope and the reliability needs that the projects are addressing were included in the draft TP and presented in the subsequent stakeholder meeting and opened to stakeholders to provide comments. The need and timing for the Phase 2 and any other potential alternatives are continuously assessed in the subsequent TPP cycles.</p> <p>Please refer to the response to your earlier comment above.</p>
2H	Defenders of Wildlife	<p>Transmission development is landscape scale development that has implications and impacts beyond just moving electrons from Point A to Point B. Transmission lines and their location inextricably impact the communities, can intensify land uses, and adversely impact natural, cultural, and tribal resources along the transmission corridor.</p> <p>Tools such as the CEC's Land Use Screening tool should be used in developing the 20-Year Transmission Outlook to allow a more comprehensive approach to transmission planning and siting that is needed for the successful development of</p>	<p>The 20-year transmission outlook analysis focuses on the technical assessment to gain an insight into the system enhancement options required to reliably serve the CEC forecast load and connect the resources in the CPUC portfolio. More detailed analysis will be performed as part of the Tariff-based 10-year transmission planning process and the optimum solutions will be recommended for approval. Such detailed analysis will be performed in coordination with state agencies and takes into account permitting feasibility.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>appropriate transmission that enables energy to reach load <u>and</u> avoids conflicts with communities, land use, natural resources, and Tribal resources. This proactive planning will increase viability, reduce costs, and provide more certainty to transmission development.</p> <p><i>Transmission Zones</i></p> <p>We request more detailed mapping of the boundaries of the transmission zones. Please release the GIS files for the zones and provide details on the methodology for delineating the zones.</p>	<p>The maps in the 20-year transmission outlook are for illustrative purposes and consistent with the zones within the ISO annual transmission process and the generation interconnection process. The ISO does not post GIS mapping of the transmission system. Details of what substation are within each of the zones can be found on the generator interconnection webpage at the following link. https://www.caiso.com/generation-transmission/generation/generator-interconnection/interconnection-request-study</p>
21	Fervo Energy Company	<p>Fervo is a developer of utility-scale enhanced geothermal systems (EGS) projects with lease holdings across the west, including California, and is actively developing projects to support the California grid, including the 400-megawatt Cape Station project in Beaver County, Utah. Cape Station will deliver its first phase of carbon-free electricity to the California grid in 2026 to support power purchase agreements (PPAs) with several California Load Service Entities (LSEs)</p> <p>In part due to California's leadership on reliability and grid decarbonization, next-generation geothermal technologies are set to play a critical role in achieving a reliable and affordable carbon-free grid. Fervo is excited to work with the CAISO to integrate these new clean firm technologies and resources into the state's resource planning to ensure a smooth and cost-effective pathway to a fully decarbonized grid. As California works to retire fossil fuel generating firm power sources and buffer itself against seasonal and climate related reliability shortfalls, Fervo hopes to continue working with the CAISO to coordinate the delivery of clean firm geothermal for Californians.</p>	<p>Thank you for your comments.</p> <p>Thank you for your comment.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>Fervo supports CAISO's new transmission zone designation for Northern Nevada Geothermal. Nevada, Utah, New Mexico and Arizona hold enormous geothermal energy that can now be developed using EGS technology. Fervo's 400MW Cape Station project is an example of this critical clean capacity. Although the Cape Station project missed this iteration of the Northern Nevada Geothermal Transmission Zone due to development timelines, it will be reflected in the next IRP cycle. Fervo greatly appreciates that the CAISO is building out formal pathways to examine the influx of clean firm power from the Mountain and Southwestern United States.</p> <p>We recognize that the resource portfolios that CAISO analyzed for the 20-Year Outlook Update were provided by the CEC, with input from and in coordination with the CPUC, and, thus, CAISO is not solely responsible for making modifications to these portfolios. Nevertheless, Fervo would like to highlight that our Cape Station project will be delivering 400MW of clean firm power to the IPPUTAH intertie by 2028 with the first project phase delivering in 2026. As we expand our projects, we anticipate that these amounts will grow, especially across CAISO delivery points Robinson and Harry Allen.</p> <p>Fervo acknowledges the challenges that the CAISO will face given the planned 15,000 MW Natural Gas Power Plant retirements listed in the 2045 Scenario. These retirements will cut California emissions, especially during evening hours (figure 1). However, California will need to not only have procured clean firm power but also must assure viable delivery pathways to connect clean firm power with California customers in order to smoothly transition away from fossil fuels. We look forward to coordinating with the CAISO, CEC, and CPUC to bring this much-needed clean firm power online.</p>	<p>Thank you for your comment</p> <p>Thank you for your comment</p> <p>Thank you for your comment</p>

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		 <p style="text-align: center;"><i>Figure 1: Comparison of hourly GHG emissions from internal ISO dispatches and imports serving CAISO load for the month of October (CAISO)</i></p> <p>Fervo would like to kindly request that the CAISO provide clarification about the cost allocation methodology envisioned for the new transmission assets proposed in the 20-Year Outlook Update used to support out of state resources. Will this new transmission be paid for by CAISO customers through the TAC or by participating generators through the Subscriber PTO model?</p> <p>Additionally, Fervo would like to request clarity on why the SWIP North line is funded through the TAC in collaboration with Idaho Power, whereas others utilize the Subscriber PTO model? We would appreciate insights on how these projects will be financed as we work to integrate our projects into the IRP process and the next cycle of the CAISO 20-Year Outlook.</p> <p>Thank you for providing the opportunity to provide feedback on the CAISO 20-Year Transmission Outlook Update. We look forward to further engagement in supporting plans to achieve state greenhouse gas reduction and other state policy goals.</p>	<p>The 20-year outlook is a high level informational study to provide an insight into the transmission enhancement requirements. Detail of the projects and their implementation are discussed in future Tariff-based 10-year annual transmission planning process.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
			Thank you for your comment
2J	Invenergy	<p>Invenergy is pleased with CAISO's inclusion of offshore wind in the 2023-2024 20-Year Outlook and appreciates the increase in offshore wind planning numbers to 20 gigawatts (GW). While the increase in overall offshore wind planning numbers is helpful, the CAISO should model additional offshore wind in the Central Coast to a minimum of 7,000 megawatts (MW), as further supported below. Higher numbers in the Central Coast align with reaching the California Energy Commission (CEC) Assembly Bill (AB) 525 planning goal of 25 GW of offshore wind capacity in California by 2045 and align with the wind energy potential in the Central Coast area.[1]</p> <p>In response to Invenergy's original comments on the 20-Year Outlook, the CAISO stated that it had pulled these numbers from the portfolios provided by the CEC and California Public Utilities Commission (CPUC). However, the methodologies used in the development of the 2045 scenarios do not consider the following:</p> <ul style="list-style-type: none"> • The power density of each existing California lease site will most likely be higher than assumed. • Floating wind turbine technology will undoubtedly evolve over the next several years, and the capacity of each individual turbine will very likely increase. <p>Studies indicate that wind turbine capacity and density figures may be higher than what is assumed in the 2045 Scenarios developed by the CEC and CPUC. The CEC and CPUC have used National Renewable Energy Laboratory (NREL) density factor estimates of 3 MW per km², on the low end, and 5 MW per square kilometer on the high end. [2] Studies have highlighted that existing wind turbines may extract more wind power over less land or water than previously thought.[3] The estimated installed power density of offshore wind turbines</p>	<p>Resource portfolio is provided by CPUC and may be updated in future 20-year outlook studies.</p> <p>Thank you for your comment</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>indicates a range of 3 to 12 MW/square kilometer (km²) and a mean of 7.36 MW/km². [4] Specifically, the 2021 Energy for Sustainable Development report written by Peter Enevoldsen from the Center for Energy Technologies at Aarhus University and Mark Jacobson from the Department of Civil and Environmental Engineering at Stanford University estimated that the installed power density of offshore wind turbines is 7.2 MW/km². [5] If this mean number were applied to the approximately 975 square kilometers that the Central Coast leases cover, this would equate to over 7,000 MW of offshore wind capacity off the Central Coast based on density figures alone.</p> <p>Finally, as the use of offshore wind energy continues to grow, we expect significant advancements in technology. The average onshore wind turbine from 2011 could produce 1.5 MW of power.[5] In 2019, the average nameplate capacity of newly installed land-based wind turbines in the United States was 2.55 MW, according to Wind Exchange, a United States Department of Energy platform for science and wind energy information.[6] This is a 70% percent increase in per turbine capacity. Given that this is a 20-Year Transmission Outlook, the CAISO should make assumptions about increased capacity from technological advancement for offshore wind turbines.</p> <p>Inenergy is working with both the CEC and CPUC to incorporate higher power densities into the Integrated Resource Planning (IRP) and SB 100 planning processes. However, given the long lead-time needed for transmission planning, the CAISO should incorporate these updated figures into the 20-Year Transmission Outlook now.</p> <p>Currently, the CAISO has modeled three scenarios of 5,400 MW being allocated between the Diablo substation and a potential new Morro Bay substation: 1) 5,400 MW mapped to the Diablo substation, 2) 5,400 MW mapped to the new Morro Bay substation, 3) 2,400 MW mapped to the new Morro Bay substation and 3,000 MW mapped to Diablo. The CAISO should</p>	<p>Thank you for your comment.</p> <p>Please refer to the response to your earlier comment above.</p> <p>Number of alternatives were considered in the 2022 20-year outlook for offshore wind capacity in the Central Coast beyond 5,400 MW.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>also consider upgrading capacity in the area beyond 5,400 MW, adding an additional 1,600 MW to the analysis, to accommodate additional offshore wind resources up to 7,000 MW. At a minimum, considering a total of 7,000 MW in a sensitivity case will allow stakeholders to evaluate the costs of additional upgrades in the Central Coast area to enable additional offshore wind in the existing lease areas.</p>	
2K	LSA	<p>A. Establish a Regular Timeline and for the 20-Year Outlook Process</p> <p>CAISO should clarify the intent and process for future iterations of the 20-Year Outlook. Now that the regular TPP horizon has been extended out to 15 years instead of 10, these two processes may begin to overlap. For example, the 2024-25 TPP horizon extends to 2039, only six years earlier than the 20-Year Outlook horizon. The 20-Year Outlook process continues to provide an important venue for CAISO to explore specific uncertainties, like the impact of low offshore wind transmission scenarios and impacts of prioritizing specific resource types as described above, with more time and flexibility than it would typically have in a TPP cycle. LSA encourages CAISO to continue providing updates to the 20-Year Outlook on at least a biannual basis even as the regular TPP process closes in on the 2045 timeframe.</p> <p>B. Use the 20 Year Outlook to Explore Significant Discrepancies with the Regular TPP Cycle</p> <p>In addition, as the horizons of the regular TPP cycles and the 20-Year Outlook begin to merge, CAISO should explore areas where there are significant discrepancies. For example, the resource plan used for the 20-Year Outlook calls for nearly 28,000 MW in the PG&E Fresno zone by 2045 while the 2024-25 TPP portfolio calls for only 10,412 MW by 2039, requiring an increase of nearly 18,000 MW in just six years. Many of the potential upgrades appropriately target this area, but the 20-Year Outlook should also explore the potential impact to other CAISO processes (e.g. interconnection, new resource integration, etc.)</p>	<p>So far, the 20-year outlook assessments have been performed on an as required basis with coordination between CAISO, CEC, and CPUC. Considering recent FERC Order 1920, future 20-year outlook type analysis will be documented in CAISO's compliance filings with FERC.</p> <p>Thank you for your comment</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>and how they may need to adjust to scale up this quickly. This type of forward thinking about areas where the 20-Year Outlook shows a need to adjust quickly from the needs identified in the regular TPP cycle could help avoid getting caught off guard by surges in activity like the “superclusters” that CAISO is currently experiencing. The 20-Year Outlook should serve as a roadmap for transmission development and other CAISO processes that may require changes to support the state’s goals.</p>	
2L	Pacific Gas & Electric	No comment	
2M	RWE Renewables	<p>RWE Offshore Wind Holdings, LLC (RWE) has a leading offshore wind development portfolio in the United States and currently holds California lease area OCS-P 0561, one of the Northern California lease areas auctioned by the Bureau of Ocean Energy Management in December 2022. RWE appreciates the opportunity to provide input to CAISO’s 20-Year Transmission Outlook Update.</p> <ol style="list-style-type: none"> 1. Design of transmission corridors for new Humboldt to Fern Road 500 kV line should consider synergies with future expansion for Del Norte offshore wind <p>When comparing option A and option B to integrate 7GW offshore wind from Del Norte, the estimate cost of Option A (2nd 500 kV line From Humboldt to Fern Road) is less expensive than Option B(500 kV line From Del Norte to Fern Road) even though option A require 4 HVDC cables from Del Norte to Humboldt. However, option B will require the development of a brand new transmission corridor with longer distance from Del Norte to Fern Road. We would like to understand more about the advantage of Option B over Option A in terms of interconnecting 7GW offshore wind from Del Norte. We would encourage CAISO to consider synergies with the expansion of new Humboldt to Fern Road 500 kV line as proposed in Draft 2023-2024 Transmission Plan to interconnect Del Norte offshore wind. If the transmission corridor (option A) from new Humboldt to Fern Road 500 kV line can be</p>	<p>Thank you for your comment</p> <p>Inclusion of alternatives with 500 kV line from Del Norte to Fern Road in the 20-year outlook is based on a recent CEC study which has considered such alternative. The approved projects in the 2023-2024 TPP has the flexibility to be expanded to either alternatives (a second Humboldt to Fern Road 500 kV line or a Del Norte to Fern Road 500 kV line). The ultimate decision on what additional transmission enhancements will be proposed for approval in the annual TPP depends on the timing, volume, and location of future North Coast offshore wind in CPUC portfolios submitted to CAISO as part of TPP.</p>

No	Submitting Organization	Comment Submitted	CAISO Response
		<p>used to add the 2nd 500 kV line From Humboldt to Fern Road, it will greatly shorten the transmission development timeline to connect and deliver Del Norte offshore wind.</p> <p>2. Consideration of regional expansion flexibility and interregional planning</p> <p>As noted in the Schatz Energy Research Center study, the main grid interconnection in Del Norte County is provided by two 115 kV lines running northeast into Oregon, as part of the PacifiCorp transmission network. We encourage CAISO to look into transmission alternatives for both option A and option B to connect existing grid in Del Norte county and potentially deliver energy to PacificCorp' load in both Del Norte county and Oregon.</p>	<p>Thank you for your comment</p>