

Kaitlyn Peterson
Legislative Clerk
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, D.C. 20515

January 3, 2024

Re: Responses of the California Independent System Operator to Additional Questions for the Record

Dear Ms. Peterson,

Thank you for the opportunity to appear before the Subcommittee on Energy, Climate, and Grid Security on Thursday, September 28, 2023, at the hearing entitled “Powering America’s Economy, Security, and Our Way of Life: Examining the State of Grid Reliability.” Please find attached the responses of Neil Millar, Vice President of Infrastructure and Operations Planning at the California Independent System Operator, to Additional Questions for the Record provided on December 18, 2023.

Please contact me with any questions.

Sincerely,

/s/

James Ralph
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cc: Rep. Diana DeGette, Ranking Member, Subcommittee on Energy, Climate, and Grid Security

Attachment: Responses to Additional Questions for the Record, California Independent System Operator

Attachment— Responses to Additional Questions for the Record

The Honorable Jeff Duncan

1. **A historic benefit of wholesale markets is that they created competition and shifted financial risk from ratepayers to private investors.**
 - a. **Do you believe that state policies mandating the use of, or providing subsidies for, certain types of generation shift the financial risk back to ratepayers?**

The bulk of the new resources added to the California ISO's balancing area have been under long-term contracts with load serving entities to meet state reliability and policy requirements. In this context, state policies that mandate that utilities procure certain resource technologies do not in themselves shift financial risk from private investors to ratepayers. Buyers and sellers of electricity apportion and manage those risks through their commercial arrangements.

2. **Is there evidence that subsidies for grid scale battery storage, solar, and wind resources suppress capacity and energy market prices in your region? If so, please describe.**

I am not aware of such evidence, and note that to the extent lower energy prices occur during some market intervals, these lower prices do not impede resource development. Within the California ISO's balancing area, local regulatory authorities such as the California Public Utilities Commission or municipal and state entities guide the procurement of resources through integrated resource planning. This is also generally the case throughout the Western United States. This procurement informs bilateral capacity prices. Existing resources not under a long-term contract are primarily procured on a shorter-term basis by load serving entities seeking to comply with the state resource adequacy program, where, again, procurement informs the bilateral capacity prices.

The California ISO electricity markets operate to reach a least cost solution based on resource and transmission constraints that exist at any point in time. This market clearing process and resultant energy prices are based on bids submitted by resources, generally tied to marginal costs. As noted above, procurement of new resources in California is driven primarily by integrated resource planning decisions and not the energy market.

- a. **In your opinion, have subsidies negatively affected market outcomes? Do subsidies for batteries, solar, and wind discourage investment for new dispatchable thermal generation? How much have these market conditions contributed to the retirement of existing dispatchable thermal resources?**

In my opinion, the development and market participation by battery, solar, and wind resources have not had a negative effect on market outcomes. These resources are part of a diverse fleet of resources the California ISO uses to balance system demand and have contributed to reliable grid operations. Like natural gas-fired resources or hydro-electric resources, they are dispatchable when they have available fuel, or, in the case of batteries, available state of charge. Procurement of these resources at the direction of local regulatory authorities obviated the need for the development of other resource technologies. Also, existing dispatchable resources, gas-fired generation capacity in particular, have predominantly retired as part of compliance with state policies on the use of coastal and estuary water for once-through cooling. The California ISO and state agencies have also retained gas-fired generation when needed for reliability purposes.

- b. **Do these subsidies and their effects on markets make your system more reliable or less reliable?**

In my opinion, the development and market participation by batteries, solar, and wind resources contribute to reliable grid operations. The integration of these diverse resources into grid operations has revealed they are capable of providing essential grid reliability services.

- c. **What steps are you taking to ensure that these subsidies are not unduly discriminatory and preferential, and that rates remain just and reasonable?**

The California ISO provides non-discriminatory open access transmission service through its federally approved transmission tariff. In planning for grid expansion or balancing supply and demand through our markets, we adhere to our tariff to ensure rates remain just and reasonable.

- d. **Would you consider state renewable mandates as out of market interventions?**

No. Numerous state laws and regulations inform the development of resources through resource planning processes for which buyers and sellers enter into bilateral arrangements. These resources participate freely in wholesale electricity markets.

3. **Recognizing that CAISO coordinates with various state agencies in California for resource adequacy, are changes needed to ensure that sufficient dispatchable thermal resources are, and remain, available to the system? How far in advance of that timeframe do you need to make changes to avoid resource adequacy and reliability issues?**

The California Public Utilities Commission's integrated resource planning process, which accounts for the bulk of the resource development in the California ISO's balancing area, plans for resource portfolios to meet both reliability and state energy goals at least 10 years forward. This forward planning process informs existing resource needs and new resource development to address future reliability needs.

Existing state resource planning and resource adequacy programs work in concert with the California ISO tariff to ensure sufficient dispatchable thermal resources remain available.

- a. **Are forward looking markets like capacity markets needed to procure enough resources that can provide essential reliability services?**

Forward procurement need not occur through a centralized capacity market. The California ISO strongly supports forward procurement of resources to ensure reliable grid operations.

- b. **Are you concerned that there will be a recurring need to defer retirements or enter into out of market contracts to retain generators if subsidies persist and the markets do not change to correct inefficiencies?**

No. As discussed above, the state resource planning and resource adequacy frameworks currently plan for new resources to meet both reliability and policy requirements several years forward, and it is essential that those processes are timely and effective. These processes should continue to allow for orderly retirement and entry of new resources.

- c. **Do all resources with a capacity obligation or counted towards resource adequacy constructs have a must-offer requirement in the day-ahead market? If not, why not? What effect does not having a must-offer requirement have on the day-ahead and realtime markets?**

Within the California ISO, resource adequacy resources generally must offer their resource adequacy capacity as energy into the day-ahead market if physically capable of operating (*i.e.*, not on outage). Some resource adequacy resources do not have a day-ahead must offer requirement because their availability is constrained by conditions beyond their control such as resources that require extremely long time to start, run-of-river resources and variable energy resources. The CAISO still accounts for their anticipated real-time production through other market and manual processes and can access these resources reliably.

4. Please describe your generator retirement process. Are current retirement processes that retain resources while transmission upgrades are implemented sufficient to prevent the scale of retirements facing RTOs/ISOs?

Under the California ISO's resource retirement process, all retiring resources must submit a formal retirement notification and attestation to the California ISO. The retirement notice requirement includes a notarized attestation from an officer with authority to bind the resource owner attesting to the reason for the retirement and that the decision to retire is definite unless the California ISO procures the resource through a reliability must run contract, the resource is sold to a non-affiliated entity, or the resource enters into a resource adequacy or some other contract. This process allows the California ISO to assess whether it needs to retain the resource to address a transmission or other need and has proved sufficient to meet reliability requirements.

a. Do you consider issues other than reliability violations on the transmission system when assessing the impacts of proposed generator retirements?

Yes. The California ISO derives its authority to designate a resource as a reliability must run resource from its transmission tariff filed with the Federal Energy Regulation Commission. That tariff provides the California ISO, subject to any existing power purchase contracts, with the right at any time based upon technical analyses and studies identifying a need on the transmission system under the California ISO's operational control or the need for ancillary services or other reliability services to designate a resource as a reliability must-run resource. The California ISO also has authority to undertake backstop procurement to cure a resource adequacy deficiency under pre-defined terms.

i For example, should violations of other reliability criteria, shortfalls of FERC-approved resource adequacy requirements, or need for essential reliability services be considered when a generator proposes to retire?

The California ISO considers the need for local resource adequacy capacity and essential system-wide reliability services when a generator proposes to retire.

b. Should RTOs/ISOs be able to retain generators until the capacity, energy, and essential reliability services they provide are replaced?

RTOs/ISOs should have the authority to designate such resources as reliability must run resources or undertake backstop procurement on behalf on the market if needed to support reliable transmission operations. The California ISO has such authority today.

5. **Electrification of the heating and transportation sectors has the potential to greatly increase electric demand and capacity needs. The nation’s top reliability organization, the North American Electric Reliability Corporation (NERC), and leaders from the Federal Energy Regulatory Commission (FERC), have testified that the bulk power system is confronting a potential reliability crisis caused by the potential loss of dispatchable thermal generation. This issue grows greater with the proposed EPA rules that will discourage coal and natural gas-fired generation. When do you anticipate reliability concerns materializing, or have they already materialized? What are you doing to solve this resource adequacy crisis and potential reliability crisis?**

The need to retain and eventually replace dispatchable generation is being monitored and managed in the California Public Utilities Commission’s integrated resource planning process as well as through longer-term resource projections conducted by the California Energy Commission.

Additionally, the state’s long-term demand forecast produced by the California Energy Commission accounts for projected load growth due to electrification in various sectors of the California economy, driving significant new resource development. State resource plans call for both new resources and the retention of a significant portion of the existing natural gas fleet to meet both California’s clean energy targets and reliability for at least the next decade. The California ISO also works closely with state agencies to assess how these resources complement each other to ensure resource adequacy across all hours of an operating day.

- a. **How do you plan to retain existing dispatchable generation and incent new entry of dispatchable generation if your markets currently do not?**

As discussed above, the California Public Utilities Commission’s integrated resource planning process plans for resource portfolios to meet both reliability and state clean energy goals at least 10 years forward. The California ISO does not operate a centralized capacity market. Instead, the state’s long-term resource planning and resource adequacy programs inform bilateral contracting between buyers and sellers. This resource adequacy framework includes procurement for flexible capacity to meet forecasted system ramping needs. Resource planning and procurement works in concert with the California ISO tariff to ensure sufficient dispatchable thermal resources remain available to support reliable grid operations.

- b. **If your system is already facing resource adequacy issues without electrification and demand increase, how will the system be able to sustain large demand growth amidst significant thermal resource retirements?**

Although existing system capacity is adequate for meeting current needs, California has added considerable new capacity to the grid over the last several years, and will need to continue to add new resources year over year for the foreseeable future to meet expected

load growth, including electric load growth from electrification of other energy sectors. Planning for system needs must also consider resource retirements.

6. While the interconnection queue is large, not all resources in the queue get built. What percentage of the generation queue has historically come onto the system? How much from the existing queue do you expect to be built?

It is correct that not all projects in the California ISO's interconnection queue will reach commercial operation. Most load serving entities typically require resources to have entered and progressed to some stage in the interconnection process in order to compete in procurement processes. As a result, queue volumes typically reflect the level of competition in procurement processes, not the volume that will actually be procured, awarded a long-term contract, and proceed to construction. Currently, the California ISO queue contains over 160,000 MW of new capacity, and over 350,000 MW has applied that will be added to the queue in 2024. These values reflect the total of all resource types. In contrast, the California ISO expects to add an average of between 6,000 and 7,000 MW of new capacity to the grid each year over the next ten to twenty years, based on the resource planning activities of the California Public Utilities Commission and the California Energy Commission.

The California ISO is currently conducting a stakeholder process to enhance its interconnection process. With the dramatic increase in new interconnection requests received recently, the California ISO is exploring interconnection process reforms. The California ISO expects to tighten project readiness requirements to ensure that projects entering into the interconnection queue are more likely to come online.

a. Can you provide an estimate of the gross cost of all the additional renewable capacity you expect to get built?

Local regulatory authorities or utilities subject to their jurisdiction may be better sources for such cost estimates. The California ISO's 20 Year Transmission Outlook published in 2022 incorporates resource portfolio assumptions provided by state agencies for planning purposes and that provides references to the inputs received from the state agencies. A copy of this California ISO's 20 Year Transmission Outlook is available at the following link:
<https://www.caiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf>

b. Can you elaborate on the projects that are delayed or canceled due to cost increases?

Projects in the interconnection queue may face delays or cancellation based on a number of reasons, including, but not limited to, siting processes, supply chain issues, inability to secure site control or a financeable power purchase agreement. The California ISO's tariff provisions currently provide some level of cost cap protection for transmission-related costs. The

California ISO does not have information on the costs of the resources themselves, or to what extent resource cost increases have driven delays or cancelations.

i **What is the reliability impact of these delays and cancelations if they force retirement of existing dispatchable thermal resources but no new capacity is added?**

As discussed previously, the bulk of recent gas-fired generation retirements were driven by policies regarding the use of once-through cooling water. Steps have been taken to retain dispatchable generation to meet reliability needs to account for changes in load growth projections and as a contingency measure to address high demands triggered by extreme heat wave events.

ii **Are these projects subject to financial penalty if they are unable to meet their obligations? Should project financiers and sponsors be required to pay for any out of market actions to retain dispatchable thermal resources?**

Owners of projects in the interconnection queue may face financial consequences if their projects face delays or cancellation, including loss of interconnection study deposits and financial security. The California ISO's federally approved tariff does not provide a mechanism to allocate the costs to retain an existing resource that would otherwise have retired to the owner of a delayed or cancelled project in the interconnection queue. The California ISO understands the impacts of project delays or cancelations are managed through the terms of the power purchase agreements that underpin new resource development, and the off-takers may be impacted through the compliance requirements with the various state capacity and energy requirements.

c. **Can you describe how much additional dispatchable thermal generation capacity you will need to balance the system if renewables are added to meet state goals? Is it financially sensible to add significant amounts of generation to meet state goals only to need to add more dispatchable thermal generation to maintain balance on the system?**

Local regulatory authorities with whom the California ISO works would have more information to respond to this question. These are the entities responsible for resource planning. The state's integrated resource planning processes develop resource portfolios to meet both reliability and the state's energy goals at least 10 years forward. As discussed above, this resource planning includes retention of the bulk of existing gas resources for at least the next decade and new dispatchable generation from sources such as battery storage.

d. **Can additional natural gas-fired generation capacity be served by the current pipeline infrastructure or is additional pipeline infrastructure needed?**

This would be a better question for local regulatory authorities or utilities because the California ISO does not regulate or plan for pipeline infrastructure.

e. **Have you been consulted by EPA or FERC on the proposed power sector regulations?**

Yes. California ISO staff have spoken with the U.S. EPA and FERC about U.S. EPA's proposal to adopt emission limits and guidelines for carbon dioxide from fossil fuel-fired power plants. The U.S. EPA has reached out the California ISO separately and to ISOs/RTOs, collectively, to discuss its proposed rule.

f. **If the EPA rules are enacted, will you be able to reliably operate your system?**

We do not believe U.S. EPA's proposal to adopt emission limits and guidelines for carbon dioxide from fossil fuel-fired power plants will undermine our ability to operate the California ISO system reliably. However, the California ISO has recommended the U.S. EPA consider establishing additional pathways in any final rule to allow resources to operate on a temporary basis notwithstanding compliance schedules, if needed to support electric grid reliability.

g. **Should nuclear play a larger role in reliably operating the system and meeting state emission targets?**

The California ISO does not select which resources or technologies participate in the markets or that states should rely on to meet emission reduction targets.

7. What is the expected cumulative cost of the transmission needed to integrate renewables?

It is difficult to assess the amount of additional transmission needed specifically to integrate renewables, as transmission planning is conducted holistically to consider reliability and policy needs in the face of load growth (demand) of other sectors of the economy. In the California ISO's 20-Year Transmission Outlook, issued in 2022 and referenced in response to question 7, the California ISO estimates an overall bulk system transmission cost of approximately \$30 billion to serve increased load and integrate the resource portfolios developed by the state to meet its emission targets. This estimate is dependent on a number of input assumptions and will likely change as the state evolves its resource portfolio assumptions.

a. **Can you describe your coordination efforts with neighboring RTOs/ISOs?**

The California ISO does not currently have a neighboring RTO/ISO. We do engage in significant coordination with neighboring balancing authorities in connection with planning discussions, market participation, and reliability coordination.

b. **What is your position on a minimum transfer requirement between planning regions?**

The California ISO does not endorse a requirement for planning regions in the Western Interconnection to establish a minimum level of transfer capability. The planning practices already account for issues that might drive a need for increased interregional transfer capability (or some other solution). The California ISO, for example, already has a framework for evaluating transfer capability through a robust study and stakeholder engagement process. The California ISO has approved transmission projects through its planning processes that have increased transfer capability between balancing authority areas, which arose from more specific study inputs related to economics or resource planning.

c. **Would a minimum transfer capability requirement undermine the autonomy of the various RTOs/ISOs and their planning processes?**

Please see response to question 7.b. Such a requirement adds an unnecessary layer of planning work and may result in unnecessary costs for transmission ratepayers.

The Honorable Kelly Armstrong

1. **Markets often have difficulty sending the appropriate price signals that account for reliability to support the development of new or improvement of existing dispatchable resources. Capacity markets appear to set prices below efficient levels, and some lack a demand curve that accurately represents needed capacity, leading to questions about resource adequacy.**

a. **Has your organization evaluated the role capacity markets play in sending price signals?**

The California ISO does not operate a centralized capacity market. In the California ISO's balancing area, buyers and sellers engage in a bilateral capacity market to secure resource adequacy capacity. The California Public Utilities Commission makes information about its resource adequacy program, including aggregated resource adequacy capacity pricing information, available in annual reports that it publishes on its website:

<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage>

- b. **Does the current demand curve establish clearing prices that are alienated from the worth of capacity and reliability?**

The California ISO does not operate a centralized capacity market.

- c. **If your organization is in the process of restructuring a demand curve, will it be implemented in a timeline aggressive enough to send appropriate price signals to dispatchable resources?**

The California ISO does not operate a centralized capacity market.

2. **Weather-dependent generation is penetrating the generation mix at an increasing rate.**

- a. **Has your organization evaluated accreditation processes for these resources?**

Yes. We have done so in coordination with local regulatory authorities in California who are responsible for accreditation processes. The California ISO works closely with local regulatory authorities on accreditation methodologies and provides feedback on accreditation rules. The California ISO, in coordination with local regulatory authorities, continues to evaluate capacity accreditation rules for all resource types as the resource mix evolves.

- i. **If so, does this accreditation consider the weather risks associated with weather-dependent generation?**

Yes. The California Public Utilities Commission, which is the largest local regulatory authority in the California ISO balancing area, currently accredits wind and solar resources using an effective load carrying capability methodology. This approach accounts for potential coincidence of weather risks. The California Public Utilities Commission will shift to a “Slice of Day” resource adequacy framework in 2025, which will evolve the CPUC’s resource adequacy framework from a focus on resource sufficiency for the gross peak hour of the day, to resource sufficiency across all hours of the day. In light of the shift to a 24-hour capacity framework, the California Public Utilities Commission will adopt new capacity accreditation methodologies for wind and solar resources, shifting from an effective load carrying capacity approach today to an exceedance methodology to derive counting values across all 24-hours. Exceedance accreditation considers historic generation output, which includes the impacts of historic weather risks. Additionally, the California Public Utilities Commission’s hydro accreditation

methodology considers historic performance and therefore accounts for historic drought conditions.

Is your organization evaluating seasonal accreditation and/or effective load carrying capability for weather-dependent generation?

As discussed above, the California ISO coordinates with local regulatory authorities who have the authority to establish capacity accreditation rules. The California Public Utilities Commission, which is the largest local regulatory authority in the California ISO balancing area, currently accredits wind and solar resources using an effective load carrying capability methodology.

b. Does your organization have the same reliability standards for weather-dependent generation as it does for dispatchable resources?

Yes, from an operational perspective, the California ISO applies the same reliability standards for weather dependent generation as it does for other resource types. In some cases, these standards take into account availability limitations or technology-specific attributes.

c. Should changes to capacity accreditation go into effect before other changes to the capacity market?

The California ISO does not operate a centralized capacity market. The California ISO tariff specifies processes and rules that work in conjunction with local regulatory authority resource adequacy programs.

3. Traditional load forecasting tools rely on customer history and interactions to approximate demand needs, including peak consumption.

a. To what extent does your organization consider external studies or critiques of load forecasting models when acquiring capacity?

The California ISO does not operate a centralized capacity market but does engage in a robust process to forecast load that includes providing input into long-term electric load forecasts developed by the state agencies within California as well as the California ISO's own short-term load forecasting efforts. The rapid deployment of behind-the-meter rooftop generation and extreme climate events, in particular, has driven changes in forecasting, planning and operating frameworks for both the transmission system and generation fleet. Developments related to electrification due to fuel switching and electric vehicle deployment have also led to a significant increase in forecast electric loads. The combined effect of changing customer

load patterns and evolving load modifiers has driven the need for far more attention not only on peak loads and total energy consumption, but also on the shape of the aggregate customer load on an hourly, daily, and seasonal basis. The California ISO actively engages with local regulatory authorities to ensure their processes related to resource capacity additions take into consideration load forecasts.

The Honorable Diana DeGette

1. What actions is CAISO taking to ensure that utilities and states with climate goals won't sacrifice those goals by joining or by being a member of your ISO?

Over the years, the California ISO has developed planning and market rules that are responsive to state climate goals. To date, these rules have allowed us to integrate new resource technologies that have advanced climate goals of various Western states. We have developed an open, transparent, and inclusive stakeholder process to ensure we continue to consider necessary rules changes. We regularly engage with state authorities to ensure we understand their states' objectives and climate goals.

The Honorable Kim Schrier

1. Thank you for answering my question on your working proposals for a day ahead market. As I mentioned in my remarks, Northwest utilities in my district, including the Bonneville Power Administration, are evaluating both CAISO's Extended Day Ahead Market and SPP's Markets Plus. If both of these day ahead markets are operating at the same time, how are you working to assure energy trading and transmission operations continue smoothly?

At this time, it is unclear where seams will exist before the Extended Day-Ahead Market and other potential Western electricity markets and services go live. The California ISO will continue to discuss potential seams issues with stakeholders and other entities to ensure any coordinated operations between adjacent markets occur in a reliable and efficient manner.