Responses to Questions for the Record of Elliot Mainzer,

President and Chief Executive Officer,

the California Independent System Operator (CAISO)

The House Committee on Energy and Commerce

Subcommittee on Energy, Hearing on March 25, 2025

"Keeping the Lights On: Examining the State of Regional Grid Reliability"

The Honorable Robert E. Latta

1. As stated in President Trump's Executive Order "Removing Barriers to American Leadership in Artificial Intelligence" (AI EO) on January 23, 2025 "It is the policy of the United States to sustain and enhance America's global AI dominance in order to promote human flourishing, economic competitiveness, and national security." President Trump has made it clear that he wants the US to be the global leader in AI and unleash American energy. How does CAISO plan to ensure sufficient supply of energy to meet the needs of data centers in a timely manner?

Response: *As the home of Silicon Valley, the CAISO is working diligently to serve emerging large electric loads within our footprint, including major enhancements to the transmission system in Silicon Valley. The CAISO implements its coordinated forward planning process with state energy agencies. In 2022, the CAISO, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) entered into a memorandum of understanding (MOU) to improve coordination and to enhance resource and transmission planning to achieve state reliability and policy needs. The CAISO manages the transmission planning and generator interconnection processes, which carefully account for the inputs provided by the CEC's demand forecast, the CPUC's integrated resource planning, and additional inputs from non-CPUC jurisdictional local regulatory authorities. All of these processes have a minimum 10 to 15-year horizon, with the CAISO also providing transmission assessments 20 years into the future.*

Based on this coordination and the work of utilities and developers, new supply resources are coming online at a rapid pace. Since 2020 about 25 GW of new generation capacity has been added to the CAISO grid, including approximately 7 GW last year. This new capacity includes over 12 GW of battery storage. To help maintain a robust pace of new resource development, the CAISO recently implemented major reforms to its interconnection process to support resource development consistent with state and local resource planning and CAISO transmission planning. The CAISO's implementation of its new interconnection reforms has shown a material reduction in projects clogging the CAISO interconnection study process.

The CAISO recognizes that our work continues in order to maintain the pace of new resource development to meet growing electric demands, including growing data center demands. We continue to work with the CPUC CEC, and all stakeholders, to enhance planning processes further, including coordinating with the CEC year-round as it updates demand forecasts to incorporate new information on data center and other large load growth, and with the CPUC as it enhances its resource procurement framework.

2. Accurate and transparent electricity load forecasting is a linchpin of modern economic development. States rely on these forecasts to plan new industrial parks, data centers, and manufacturing hubs, while utilities use them to schedule grid expansions and major infrastructure investments. Despite the vital role of load forecasts in spurring economic growth, practices vary widely among states, utilities and RTO/ISOs, often leading to inconsistent data, misaligned investment signals, and unnecessary risk for both utilities, and both large and residential customers. Recent inconsistencies underscore how a patchwork of forecasting methodologies can exacerbate speculation in large load interconnection requests, inflate demand projections, and drive-up costs. These issues cross both state and federal jurisdictions and regional differences.

a. What steps is CAISO taking to ensure its load forecasting is transparent, predictable and correctly anticipating future capacity and infrastructure needs to power AI infrastructure?

Response: *The CAISO relies on the CEC's long-term demand forecast as an input into its transmission planning process. The CAISO works closely with the CEC as it develops updates to its demand forecast each year. The CEC develops its annual forecast through a public process with opportunities for stakeholder engagement and comment. The CEC also works directly with load-serving entities, industry experts, and utilities who manage load interconnection requests to share information and understand the magnitude and nature of large load growth, including increasing requests to connect data centers.*

b. What, if any, barriers exist to increased transparency on potential load growth from AI?

Response: *The CEC continues to work with utilities, industry, and experts in the field to gain additional insights into load growth from AI, data center load profiles, and utility load applications to continue to enhance the CEC's data center forecasts. This process will help identify barriers to understand potential load growth from AI and how to gain greater certainty about where and when that load growth will occur.*

3. How can RTOs accelerate transmission expansion to support load growth without creating excessive costs for ratepayers?

Response: *The CAISO is doing all we can to help bend the cost curve for consumers in the right direction. Over the past several years, the pace for bringing new resources online to meet growing demand has accelerated and the CAISO has been working to reduce "friction" on the grid and advance transmission expansion in a number of different ways:*

o Reforming our interconnection process so that it is nimbler, allowing new generating capacity to be onboarded more quickly and efficiently;

o Exploring a wide variety of possible solutions in the CAISO's annual transmission plans before recommending the most cost-effective options possible, including grid-enhancing technologies that can – where applicable – increase capacity for a fraction of the cost of new lines;

o Coordinating closely with our partners in state government, most notably the CPUC and CEC so our distinct roles in planning, building and operating the transmission grid complement one another and do not work at cross purposes, which would cause delays that increase costs.

4. From a siting and permitting perspective, what do you see as the challenges and barriers to constructing sufficient transmission infrastructure needed for reliable, safe, affordable, and timely delivery of power?

a. What role, if any, should Congress and FERC play in siting and permitting for regional or interregional transmission?

Response*: The CAISO is not a siting or permitting entity and is also not a developer. The CAISO defers to these entities with respect to the challenges and barriers to constructing transmission as well as the role that Congress or FERC should lay in siting and permitting regional or interregional transmission.*

As a regional transmission planner, the CAISO does proactively and regularly plans to meet the challenges of tomorrow and welcomes the opportunity to discuss how to build the grid of the future. As an example, the CAISO's most recent annual transmission plan approved transmission to account for resource needs of more than 76,000 MW by 2039. The CAISO's July 2024 20-Year Transmission Outlook provides a macro analysis of California's future transmission network to meet the state's energy goals and highlights the challenges associated with building major pieces of infrastructure. This work also supports our coordination with other planning regions in the West.

5. Regarding planning for transmission, what specific impediments have you identified to current state, regional, and interregional planning for transmission projects?

a. What are examples of impediments you have identified and what is necessary for system planners to overcome these impediments?

Response: *The impediments for transmission planning likely differ between regions. The CAISO encourages a planning framework that accounts for differences among regions, and that emphasizes outcomes over process. At this point, we do not see the need for increased process reforms. Instead, federal authorities should encourage partnership among neighboring balancing authorities and planning regions to maximize benefits to electricity customers. Fostering existing partnerships to deploy infrastructure solutions and balance supply and demand across the western United States is essential to ensure electric reliability and affordability.*

b. What reforms do you recommend to improve state, regional, and interregional planning to overcome these impediments?

Response: *The impediments for transmission planning likely differ between regions. The CAISO encourages a planning framework that accounts for differences among regions, and that emphasizes outcomes over process. At this point, we do not see the need for increased process reforms. Instead, federal authorities should encourage partnership among neighboring balancing authorities and planning regions to maximize benefits to electricity customers. Fostering existing partnerships to deploy infrastructure solutions and balance supply and demand across the western United States is essential to ensure electric reliability and affordability.*

6. In the last Congress and the previous administration, there was a lot of talk about transmission policy reform.

a. How does your organization plan transmission in your region and with other regions? What should Members understand about the nature of transmission planning as it exists today?

Response: *The CAISO has leveraged our engagement with state and local regulatory authorities to ensure proactive, coordinated transmission planning. Our transmission planning process is open to the public and transparent. To develop the plan, we build on prior planning work, identify scenarios to study, rely on state-identified resource portfolios, and examine proposed transmission additions. The 2024-2025 Transmission Plan, which was recently approved by the CAISO's Board of Governors, approved 31 regional (within the ISO footprint) transmission projects, for a total infrastructure investment of an estimated $4.8 billion. Of the 31 projects, 28 were reliability-driven, meaning that they primarily support load growth and evolving grid conditions, ensuring a reliable system.*

The CAISO also regularly engages with neighboring planning regions on interregional projects (projects across multiple planning region footprints), as required under FERC Order No. 1000. However, the interregional planning process required by FERC Order No. 1000 has not yielded any interregional transmission projects in the West. Given this reality, the CAISO has relied on the ability to engage in voluntary agreements and bilateral agreements with other neighboring balancing areas to enable development and develop a cost-allocation framework for new multi-state transmission lines. Further, the CAISO developed a new approach to planning and financing independent transmission development through creation of the subscriber participating transmission owner model, which FERC approved in 2024 and enables new transmission projects to be connected to the CAISO balancing authority area and be placed under the CAISO's operational control. Rather than allocating costs through the transmission access charge, the model allows transmission project developers to receive transmission project funding through the cost of the associated generation.

The CAISO's proactive approach to infrastructure development has enabled the CAISO to onboard and connect 25 GW of generation in the past five years, which has sustained the grid and economic growth during several extended extreme heat and weather events over the past few years.

b. Does a top-down approach, through FERC, serve the interests of utilities and grid operators that are already expending tremendous time and engineering resources on design new transmission?

Response: *Each transmission provider is unique in its approach to transmission planning. The FERC established framework for transmission planning has helped advance the CAISO's efforts. In addition, FERC has recognized the need for regions to deviate from a one-size fits all approach, which has been particularly helpful in certain cases. Congress and FERC should avoid adoption of overly prescriptive requirements that may not advance the objective of deploying new transmission.*

7. What would be your top priority or need from states, FERC or Congress to assist you in meeting new demand —especially if we need even more power than projected? Are you equipped today to meet increased future demand at the pace needed and to maintain affordability and competitive rates?

Response: *The CAISO works hard to prepare to meet increased future demand at the pace necessary to maintain reliability and affordability by approving the necessary infrastructure projects to meet the CAISO's projected demand. The coordination and synchronization of our planning process with state processes to forecast demand and direct resource procurement provides a powerful tool to meet increased future demand while considering affordability. Support for these processes should address current barriers to energy infrastructure development, such as supply chain disruptions, workforce shortages, price uncertainty, access to capital, and permitting process.*

The Honorable Rick Allen

1. Nearly twenty percent of our nation's electricity is generated by 94 nuclear reactors. Constructed forty to fifty years ago, these reactors represent enduring assets that continue to deliver significant value long after the visionary decisions to build them were made. Today's market conditions, however, would likely discourage companies from pursuing such generational investments. As states grapple with rising power demands, they are seeking innovative tools to drive the deployment of next-generation nuclear facilities.

a. How can these potential state actions fit within your markets?

Response: *The CAISO is currently operating Diablo Canyon Power Plant, located in San Luis Obispo County, California, through 2030. Based on current state resource planning, the state has not identified additional nuclear projects in the state. The CAISO's infrastructure planning processes and generator interconnection process are designed to help advance and connect generation consistent with state resource plans. Our energy and ancillary markets provide the ability of all interconnected resources to offer their supply to serve demand and provide mechanisms to operationalize the attributes those resources provide, including the provision of energy, ancillary services, and flexibility. The development of a day-ahead market construct throughout the western United States will help ensure resources located in participating balancing authority areas support efficient and reliable operation of the grid.*

The Honorable Kathy Castor

1. One of our greatest challenges today is getting new sources of electricity on the grid as quickly as possible in this new era of increasing electricity demand. Interconnection processes – while critical to maintaining the reliability of the grid – can also take far too long under the current framework. On March 17, FERC Commissioner David Rosner wrote a letter to each of you detailing new opportunities to streamline the interconnection process. In a recent study by the Midcontinent Independent System Operator (MISO), an automated process was able to nearly replicate in ten days the results of an interconnection study that took nearly two years to conduct.

a. Please describe your experience with interconnection automation technologies to date and the prospects for further deploying them going forward.

Response: *Given the evolution of the CAISO's interconnection processes and the challenges we face in maintaining the pace of new resource interconnections to meet new load requirements, we agree exploring this topic is timely and necessary. We are open to any solutions that can help us achieve and sustain the pace of resource interconnection necessary to meet near-term reliability needs and longer-term policy requirements.*

The tools we have reviewed to date address two discrete components of the interconnection process: (1) managing intake of new interconnection requests to collect and validate necessary data and models, and (2) conducting the necessary power system studies to determine network upgrade requirements. The CAISO's recent interconnection challenges have resulted from unprecedented amounts of capacity submitted to the interconnection queue, which rendered study results meaningless. Therefore, we have focused our deployment of tools on the interconnection request intake process.

The CAISO transitioned to a cluster study process roughly a decade ago, essentially "batch processing" applications with rigid timelines established in tariffs. An unprecedented number of applications eventually required a delay in processing results in our interconnection queue cluster 14 in 2021 and major interconnection reform in 2023 and 2024. During this timeframe, the CAISO has generally sustained study timelines. However, after the cluster 15 interconnection request window in 2023, the number and capacity of interconnection requests in our queue far exceeded the capacity we expect to need over the next 20 years. This surplus has led the CAISO to prioritize management of the number of requests to yield more viable projects at the beginning of the process.

Given our previous experiences, the CAISO is focusing its investment and new applications on the issue of interconnection request intake and management. We are in the process of transitioning from our legacy Resource Interconnection Management System (RIMS) tool to a third-party application to manage the interconnection application and study process as well as the contracting and queue management processes. This new, customized platform, known as the Grid Resource Interconnection Portal (GRIP) allows increased levels of automation between the CAISO, transmission owners, and interconnection customers, and enhanced opportunities for data validation and management. The portal provides a

single application for all interconnection customers and CAISO staff to access and update data on individual projects, significantly reducing email traffic and automating processes. For example, this application can reduce the time required to develop a single Generator Interconnection Agreement from several weeks to a few minutes. Additional enhancements to GRIP will provide increased transparency on project permitting, procurement, and construction information provided by the interconnection customers and participating transmission owners. We understand that the software provider expects to develop artificial intelligence capabilities in the future to streamline data validation and model building capabilities.

Regarding tools to automate and streamline the interconnection study process, the CAISO currently relies on the PowerGEM TARA power flow software tool. We have explored opportunities to more efficiently build models and complete studies; however, our review suggests only modest benefit from the use of new tools for the CAISO at this time. We will continue to explore the potential benefits of advanced software solutions in the interconnection study process, seeking solutions tailored to our greatest challenges.

b. Please describe how FERC and Congress can each support such innovation.

Response: *FERC has demonstrated considerable interest in this topic, with a technical workshop on interconnection and follow-up discussions on the use of advanced software and artificial intelligence with transmission planners. FERC continues to support information sharing related to best practices and opportunities for efficiency. Congress can support funding for projects that seek to adopt these new technologies.*

The Honorable Scott Peters

1. Have you experienced permitting delays that this committee should better understand? What are some key/important examples?

Response: *Infrastructure permitting delays have occurred within the CAISO region as they have in other regions of the country. In recent years, the CPUC and state legislature recognized a need to reform state electric infrastructure permitting processes to support the rapid development of new grid infrastructure and connection of new supply resources to support growing electric demands. As a result, the state of California has advanced legislation in recent years to reform state electric infrastructure permitting processes. These directives, along with several other transmission infrastructure permitting and siting reforms were adopted and implemented by the CPUC earlier this year. The intent of these reforms is to modernize and accelerate how transmission infrastructure is planned, permitted, and built.*

2. What laws (on permitting specifically, but also planning, siting, interconnection, cost allocation, etc.) should be changed/amended/improved with regard to permitting?

Response: *The CAISO is not a siting or permitting entity and is also not a developer. The CAISO defers to these entities with respect to the challenges and barriers to constructing transmission as well as the role that Congress or FERC should lay in siting and permitting regional or interregional transmission.*

3. What are your specific challenges when it comes to planning and cost allocating high voltage transmission lines?

Response: *The CAISO prepares its annual Transmission Plan as part of its core responsibility to identify and plan the development of solutions to meet the future needs of the CAISO-controlled transmission grid. The Plan is prepared through the annual transmission planning process that culminates in a CAISO Board of Governors approval of the Transmission Plan.*

The need for additional generation of electricity over the next 10 years has escalated rapidly in California to meet forecasted demand and implement the state's energy policies. This increased need for resources corresponds to an accelerated pace for new transmission development. To help ensure we have the transmission in place to support new resources and loads reliably and cost-effectively, the ISO's 2024-2025 Transmission Plan builds on the much more strategic and proactive approach initially adopted in the 2022-2023 Transmission Plan and carried forward since to better synchronize power and transmission planning, interconnection queuing and resource procurement. The CAISO's cost allocation rules for transmission have provided a durable approach to allocate the cost of high-voltage lines either to customers in a participating transmission owner or across the CAISO system. In addition, FERC recently approved an alternate model in which subscribers to a new high-voltage transmission line pay for the cost of that line. Two projects, TransWest Express and Sunzia, are seeking to participate under this alternative model to connect out of state resources to the CAISO. Our coordination with adjacent states, utilities, and developers provides a new path to support development across the region. The CAISO strives to find cost allocation solutions that meet the needs of the grid, and the customers served in the region.

Figure 1 reflects recent transmission developments in the Western United States. These transmission projects will support resources identified in the CPUC's resource planning efforts and increase reliability and foster economic development in the West.

Policy attention should address the current barriers to energy infrastructure development, such as supply chain disruptions, workforce shortages, price uncertainty, access to capital, and permitting delays.

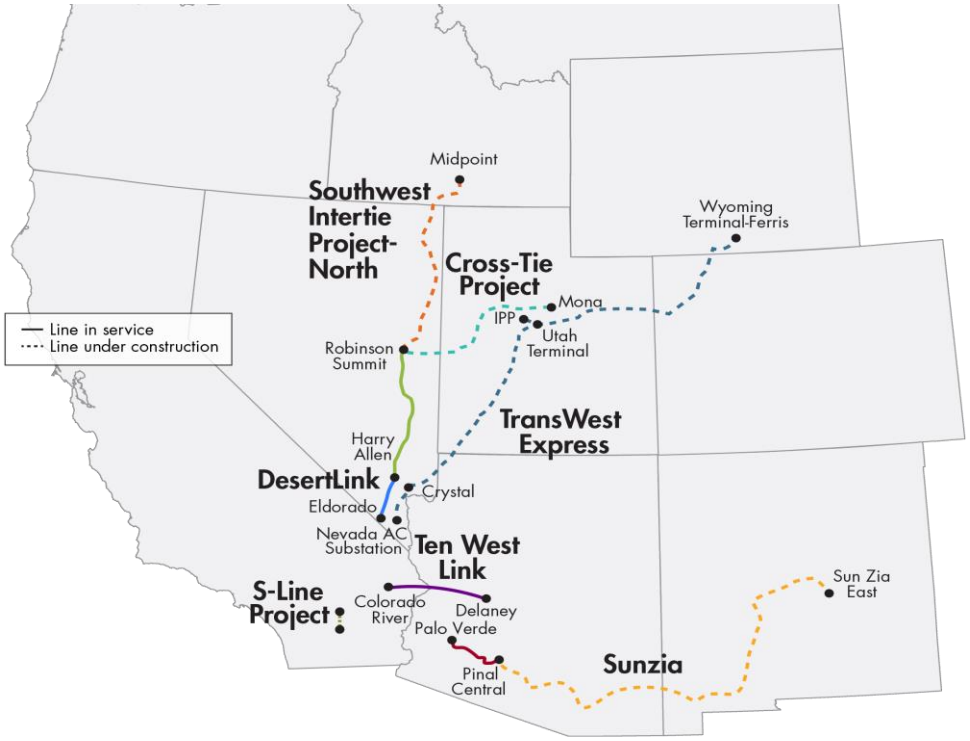

Figure 1. Multi-state transmission projects that deliver west-wide benefits and enhance resilience.