Report to the Governor on Priority SB 100 Actions to Accelerate the Transition to Carbon-Free Energy

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California Energy Commission

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ABSTRACT

This report responds to the Proclamation of a State of Emergency issued by Governor Gavin Newsom on July 30, 2021, to free up electricity to meet demand during extreme heat events and wildfires and to expedite deployment of clean energy resources. The proclamation called for the California Energy Commission, in consultation with the California Public Utilities Commission, California Air Resources Board, and the California Independent System Operator, to submit a report to the Governor within 60 days of the proclamation that prioritizes actions from the 2021 Joint Agency SB 100 Report to accelerate the state's transition to clean, carbon-free electricity. The report discusses ongoing challenges to bring clean energy resources online, actions taken by the agencies and California Independent System Operator to address system reliability issues and accelerate the state's transition to a clean energy system, and includes recommendations for priority actions to address some of these challenges.

Keywords: Emergency proclamation, system reliability, state actions, SB 100, recommended actions, clean energy, resource procurement, transmission, permitting, land use

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EXECUTIVE SUMMARY

On July 30, 2021, Governor Gavin Newsom issued a Proclamation of a State of Emergency to free up electricity to meet demand during extreme heat events and wildfires and to expedite deployment of clean energy resources. The proclamation reads: "[t]he California Energy Commission, in consultation with the California Air Resources Board, the California Independent System Operator, and the California Public Utilities Commission, shall identify and prioritize action on recommendations in the March 2021 Senate Bill (SB) 100 Joint Agency Report, and any additional actions, that would accelerate the State's transition to carbon-free energy." The California Energy Commission (CEC), California Public Utilities Commission (CPUC), California Air Resources Board, and California Independent System Operator (CAISO) developed this report to respond to this request.

Senate Bill 100 (De León, Chapter 312, Statutes of 2018) (SB 100) sets an ambitious target of powering all retail electricity sold in California and state agency electricity needs with renewable and zero-carbon resources by 2045. Moving toward 100 percent clean electricity will increase access to clean energy for Californians, reduce air pollution, improve public health, and support the emissions reductions in other sectors, such as transportation and buildings. Two key priorities as the state works to meet the SB 100 goals are to maintain system reliability and to increase affordability.

The August 2020 rotating outages revealed vulnerabilities in the reliability of the state's electricity supply, particularly during net peak hours when solar generation is no longer available. Over the past year, the agencies and CAISO have implemented several actions to improve near-term system reliability. The CPUC procured new supply and demand side resources for Summer 2021 and 2022, the CAISO implemented market changes to more accurately reflect supply and demand during stressed hours; the CEC reviewed and approved efficiency improvements at existing power plants to increase their generation capacity; the CEC developed new analyses to assess summer reliability; and the CPUC funded the Flex Alert paid media campaign to encourage customer conservation during hours of grid stress.

In addition to these near-term actions to increase supply and reduce demand, to carry out the transition to 100 percent clean energy, the state needs an unprecedented increase in clean energy generation and energy storage projects to replace the fossil-fueled resources that currently maintain system reliability. The acceleration of this goal, as directed in the Governor's Emergency Proclamation, requires actions to push these projects forward and to address any challenges that prevent or slow their progress. The key action areas are: permitting, availability of needed transmission, information sharing to enable more streamlined approval processes, and rate structures and financing models that support energy and climate goals.

In this report, the agencies and CAISO discuss these action areas and provide recommendations for expediting the transition to clean energy.

CHAPTER 1: Introduction

The state's electric system is in a period of transition. Nearly 6,000 megawatts (MWs) of firm and dispatchable resources are expected to be retired over the next five years, including the remaining once-through-cooling (OTC) plants and Diablo Canyon Nuclear Power Plant. At the same time, the state continues to rapidly expand deployment of renewable resources to support SB 100 targets, and plan for increased electrification and climate-induced demand and supply uncertainties. As the state continues its transition toward clean resources, it is vital to ensure that the transition is reliable and equitable, both of which have been brought into focus following the rotating outages in August 2020. These dual goals of reliability, especially near term, and the rapid transition toward SB 100 goals are achievable and complementary, but require a deliberate and robust coordination amongst the California Energy Commission (CEC), the California Public Utilities Commission (CPUC), the California Air Resources Board (CARB), and the California Independent System Operator (CAISO).

Continued Urgency to Ensure Electric Reliability

Extreme heat events in 2020 impacted the western United States and strained electric system operations in California resulting in rotating outages on August 14 and 15, 2020. On August 17, 2020, Governor Gavin Newsom sent a letter to the CEC, the CPUC, and the CAISO requesting, among other things, that the CAISO complete an after-action report to identify root causes of the events. This after-action report (Final Root Cause Analysis[1]) was published on January 13, 2021, and identified three root causes that led to the rotating outages and identified actions to be taken by the three entities to reduce the potential for future grid outages.

Over the past year, the CEC, CPUC, and CAISO have worked collaboratively to implement the actions highlighted in the Final Root Cause Analysis. Since December 2020, the three entities have submitted monthly reports to the Assembly Committee on Utilities and Energy describing the actions they have taken to ensure electric reliability.[2] These actions include the CPUC's Emergency Reliability proceeding (R.20-11-003) to procure new supply and demand side resources for Summer 2021 and 2022, CAISO's implementation of market changes to more accurately reflect supply and demand during stressed hours, CEC review and approval of incremental efficiency

1 Final Root Cause Analysis Mid-August 2020 Extreme Heat Wave. January 13, 2021. California Independent System Operator, California Energy Commission, California Public Utilities Commissioner. Available at http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

2 Summer Reliability. 2021. California Public Utilities Commission. Available at https://www.cpuc.ca.gov/news-and-updates/newsroom/summer-2021-reliability.

improvements at existing power plants, CEC's new reliability analysis to assess summer reliability, and the CPUC funding of the Flex Alert paid media campaign to encourage customer conservation during hours of grid stress.

The record-breaking heat in California, combined with the continued impacts of a drought and wildfires, led to tight grid conditions during the summer of 2021. Through July 30, 2021, CAISO issued six Flex Alerts and the administration, agencies, and CAISO called on contingency resources to support grid operations multiple times. This led to Governor Newsom issuing an Emergency Proclamation on July 30, 2021, declaring an energy emergency and ordering multiple actions to enable additional capacity to support electric reliability. One of the actions called for in the Emergency Proclamation is, "[t]he California Energy Commission, in consultation with the California Air Resources Board, the California Independent System Operator, and the California Public Utilities Commission, shall identify and prioritize action on recommendations in the March 2021 Senate Bill (SB) 100 Joint Agency Report,[3] and any additional actions, that would accelerate the State's transition to carbon-free energy. The California Energy Commission shall report its recommendations to me within 60 days."

In this report, the CEC, CPUC, and the CARB, known collectively as the joint agencies, and CAISO describe the actions they have taken to date to meet the SB 100 goals and ensure electric reliability. Using information from current proceedings and other ongoing efforts, the joint agencies and CAISO highlight challenges that should be addressed to achieve or accelerate the SB 100 (De León, Chapter 312, Statutes of 2018) goals while maintaining a reliable electric grid and reasonable costs to ratepayers. Finally, the joint agencies and CAISO recommend actions and areas for further review to best position the state to meet the SB 100 goals and accelerate the transition to a carbon-free energy system.

SB 100 Requires a Rapid and Sustained Transition to Renewable and Zero-Carbon Resources

SB 100, also known as the 100 Percent Clean Energy Act of 2018, is landmark legislation that established the state policy that renewable and zero-carbon resources supply 100 percent of retail sales and electricity procured to serve all state agencies by 2045. The legislation also increased the state's Renewables Portfolio Standard (RPS) target to 60 percent of retail sales by December 31, 2030 and required all state agencies to incorporate these targets into their relevant planning.

3 Gill, Liz, Aleecia Gutierrez, and Terra Weeks. 2021. *2021 SB 100 Joint Agency Report. Achieving 100 Percent Clean Electricity in California: An Initial Assessment*. California Energy Commission. Public Number: CEC-200-2021-001. Available at https://efiling.energy.ca.gov/EFiling/GetFile.aspx?tn=237167&DocumentContentId=70349.

SB 100 Joint Agency Report

SB 100 called upon the CPUC, CEC, and the CARB to use programs under existing statutes to achieve this policy and issue a joint policy report to the Legislature by January 1, 2021, and every four years thereafter.

The 2021 SB 100 Joint Agency Report, submitted to the legislature in March 2021, was developed with over a year and a half of robust stakeholder engagement. The report evaluated potential resource pathways to meeting the 2045 policy through modeling scenarios, highlighted additional considerations for implementation and provided recommendations for future reports and SB 100 implementation. The report included thirteen recommendations to the agencies for further assessment to be incorporated in the 2025 SB 100 Report, process and engagement improvements for future reports, and supportive actions for the achievement of the 100 percent target. Specific to successful realization of SB 100 goals, the report recommended continued state support for research and innovation in clean energy technologies; prioritization of energy efficiency and load flexibility to minimize total implementation costs; and a need to identify and address bottlenecks in project permitting and development.

Ongoing Joint Agency Work on SB 100 Implementation

The 2021 SB 100 Joint Agency Report indicated that achieving the 2045 goal is technically feasible but will require sustained record setting build rates of renewable resources, zero-carbon technologies, and integration solutions, such as storage and demand response. Achieving SB 100 goals requires persistent and rigorous analysis of implementation considerations and coordinated planning between the state agencies. To that end, the joint agencies and CAISO are coordinating through an SB 100 Implementation: Planning for SB 100 Resource Build (SB 100 Implementation) process and workshop series that addresses infrastructure planning and continued analytical refinements.[4] The workshop series will lead up to the next SB 100 Joint Agency report in 2025, including an annual update workshop, as recommended by the 2021 SB 100 Joint Agency report.

Infrastructure workshop topics have ranged from resource and transmission planning to resource mapping that will assist in examining the potential environmental and land use implications of potential buildouts of renewable energy resources modeled to meet SB 100 goals. These workshops are designed to inform agency energy planning processes such as the CPUC's Integrated Resource Planning (IRP) Process, the CAISO Transmission Planning Process (TPP), the CEC's Integrated Energy Policy Report (IEPR), the next SB 100 Joint Agency Report, and other energy planning activities. Stakeholder comments from these workshops focused on the need to move faster on transmission infrastructure planning and permitting and provided valuable input that will help better evaluate available renewable energy resources and examine potential

4 https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=21-SIT-01

environmental and land use issues. This process also resulted in the development of a Starting Point scenario to be used in the CAISO's 20-Year Transmission Outlook.[5]

Future workshops will address analytical development in preparation for the next SB 100 Joint Agency Report process and to support broader state planning. Later this year, there will be a workshop to assess the reliability of the portfolios in the 2021 SB 100 Joint Agency Report and begin to develop approaches to assess non-energy benefits in future modeling efforts. Additional work includes evaluating the role of distributed energy resources in meeting SB 100, as well as how to accurately characterize and value them in portfolio development and modeling.

Electric Reliability and SB 100 Require Ongoing Resource Procurement

Maintaining electric reliability and meeting the state's clean energy goals are both contingent on successful and timely procurement of clean energy resources. California has experienced tremendous growth in new clean energy resources over the past year. The state's electric grid has seen over 50 new electricity projects achieve commercial operation, and each of the next two years are expected to see a similar number of new projects. In terms of new capacity, 3,850 megawatts (MW) of new nameplate capacity was brought online to serve the CAISO grid between July 2020 and August 2021. Continued and sustained timely procurement is essential to support both reliability and SB 100 goals.

Near-term projections indicate that a combination of new procurement and contingency resources will be needed to prevent a supply shortfall should California experience continued drought and another west-wide heat event similar to that experienced in summers 2020 and 2021, and to address impending retirements of gas-fired generation employing coastal waters for once-through cooling as well as the Diablo Canyon Nuclear Power Plant. Beyond California, climate change has also increased west-wide loads in summer, even in traditionally winter-peaking systems, and reduced supply that has typically supported imports into California.

Emergency Summer Reliability Procurement

The CPUC established an Emergency Reliability Rulemaking (R.20-11-003) in November 2020, following the rotating outages experienced in August 2020. This proceeding was initiated to ensure reliable electric service in California in the event of an extreme weather event in 2021.

In March 2021, the CPUC approved contracts from the state's three large investor-owned utilities (IOUs) for approximately 564 MW by summer 2021. The CPUC also approved and directed (D.21-03-056) the IOUs to take multiple actions to avert the

5 https://efiling.energy.ca.gov/GetDocument.aspx?tn=239685&DocumentContentId=73101

potential need for rotating outages in the summers of 2021 and 2022, including launching a new statewide demand response program, the Emergency Load Reduction Program (ELRP) pilot; modifying the IOUs' existing demand response and Critical Peak Pricing programs; funding a new statewide Flex Alert media campaign; and increasing the planning reserve margin — the buffer that accounts for extreme conditions and unexpected outages — by allowing the IOUs to procure to a target of 17.5 percent.[6]

As of mid-September 2021, the CPUC has tracked over 3,000 MW of additional resources that have become available as a result of the Emergency Reliability Rulemaking and prior procurement requirements (for example, IRP procurement orders, RPS requirements, etc.). The additional resources include 1,500 MW net qualifying capacity (NQC) of new clean energy projects, and about 1,500 MW from incremental capacity from existing facilities, imports, and demand side programs such as ELRP. Customers with approximately 200 MW of load reduction potential have enrolled in ELRP, and new customers continue to enroll.

In response to Governor Newsom's Emergency Proclamation, the CPUC released a new scoping ruling on August 10, 2021, focused on additional actions that the CPUC could undertake to secure reliability programs or procurement for Summers 2022 and 2023. The CPUC received opening testimony with proposals from 49 parties on September 1, 2021 and expects to issue a proposed decision by late October.

Integrated Resource Planning Procurement

In addition to the Emergency Reliability Rulemaking, the CPUC ordered load serving entities (LSEs) to procure 14,800 MW of procurement in its ongoing IRP Rulemaking (R.20-05-003) to backfill capacity from retiring natural gas plants and the Diablo Canyon Power Plant and meet the electric sector greenhouse gas (GHG) emissions planning targets. The CPUC ordered this 14,800 MW in two orders.

First, in November 2019, the CPUC ordered LSEs to procure 3,300 MW NQC of new resources by 2023. LSEs have reported procurement contracts for almost 4,000 MW NQC. Second, in June 2021, the CPUC ordered the procurement of 11,500 MW of new NQC to come online in the years 2023-2026 (D.21-06-035), requiring all resources procured to be zero-emitting or otherwise RPS-eligible. The resources are needed to respond to more extreme weather events and replace electricity generation from more than 3,700 MW of retiring natural gas plants and 2,200 MW from Diablo Canyon Power Plant. While the order specifies procurement of 11,500 MW of NQC, the total nameplate capacity of these resources is expected to exceed 14,000 MW depending on the technologies implemented in compliance with the order. The June 2021 order

6 The official planning reserve margin remains 15 percent.

will help ensure reliability in the mid-decade, keep California on track to achieve its climate goals, and spur the development of the clean firm resources needed for deep decarbonization.

These orders implement and build upon the CPUC's April 2020 planning order that anticipated the need for as much as 24,400 MW of new resources by 2030, and they will be followed with additional procurement orders to meet the state's GHG reduction targets while maintaining reliability.

Resource Adequacy and Procurement

While procurement of new "steel in the ground" is essential to meeting the state's reliability and clean energy goals, it is equally essential that contracting requirements adequately reflect the reliability needs and include appropriate counting and bidding rules for the resources being procured. The Resource Adequacy program is one of the primary regulatory levers to ensure the state has sufficient resources available to ensure reliability. The Resource Adequacy program has short-term planning standards and a detailed programmatic compliance regime that requires LSEs to supply capacity to the energy markets such that it can be dispatched by grid operators. The Resource Adequacy program has focused on ensuring that the grid operators have access to existing resources via a "must offer obligation" such that withholding of energy cannot occur.

The CPUC adopted several decisions in the Resource Adequacy program in 2021 to further refine the program. The Resource Adequacy program has considered or adopted proposals related to changes to planning reserve margin, import rules, hybrid resource qualifying capacity rules, demand response qualifying capacity rules, resource adequacy penalty structure for deficiencies, and modifications to the required availability hours for use-limited capacity resources.

Contingency Planning for Reliability

As the joint agencies and CAISO continue to accelerate and expand procurement for the state and refine planning processes to adequately account for climate impacts, it is still necessary to plan for contingencies in case of extreme weather events, similar to what was experienced in summer 2020, or unplanned outages. In August 2021, the CEC, CPUC, and CAISO released a contingency plan to further assist reliability planning. The Contingency Plan describes how those entities will coordinate in advance of and throughout an anticipated electricity supply shortfall event in the CAISO balancing area. It systematized measures that were enacted last year, identified additional measures, and created the processes and structures to enable advanced coordination. It also describes the roles and responsibilities of each institution to identify and pursue contingency resources, as well as the triggers associated with engaging each resource.

CHAPTER 2:
Barriers to Meeting and Accelerating SB 100

As discussed above, over the past year, the joint agencies and CAISO prioritized and took action to address near- and mid-term reliability and support SB 100 goals. Ultimately, ensuring electric reliability and achieving SB 100 goals will require successful and timely resource procurement. However, a number of barriers exist that must be addressed in order to meet both the state's near-term and long-term goals. Planning and permitting efforts, including at the local level, must continue to evolve to keep pace with the required build rates, maintain reliability and direct procurement, and advance the statewide imperative to reduce the reliance on natural gas for system and local reliability. Rate impacts from climate adaptation and necessary procurement must be mitigated. Long-duration storage technologies must be explored and supported. Pathways for long lead time resources must be better established and market improvements must be made to improve both regional coordination and demand-side flexibility. This chapter describes the key challenges, current efforts, and recommendations for achieving SB 100 goals and accelerating the state's transition to carbon-free energy. The complexity and potentially cross-cutting impacts of these issues require careful thought and consideration, and the joint agencies and CAISO relied on information from existing proceedings to help formulate the recommendations.

Challenges to Realization of Procurement

Significant procurement has been ordered to meet near- and mid-term reliability needs, and the CPUC is now tracking hundreds of projects, representing thousands of MWs, expected to achieve commercial operation in the next few years. Recognizing the challenge of integrating so many resources to the electric grid in such a short period of time, the joint agencies and CAISO are forming an interagency task force with the Governor's Office of Business and Economic Development (GO-Biz) to address barriers to procurement through tracking, identifying, and resolving issues with individual projects that are critical for the transition to a clean energy future. The goal of this effort is to work with project developers, LSEs, utilities, and/or local officials to help mitigate problems quickly, before they can significantly impede a project's ability to reach commercial operation. However, a number of systemic barriers to procurement remain. It will be necessary to address these barriers to best position the state to meet its reliability and clean energy goals.

Potential Supply Chain and Project Development Challenges

Most major infrastructure investments require long lead times for procurement of major equipment, complex engineering and construction schedules, and intensive permitting and public review. The era of clean energy leading to the realization of the

SB 100 goals will be no different. Although the joint agencies, CAISO, and GO-Biz are committed to closely tracking progress on project development needs for summer reliability and to help address and overcome any barriers, California energy markets are dependent on complex worldwide markets that are subject to supply chain disruptions. Throughout 2020 and 2021, the world's shipping markets were severely disrupted due to COVID-19. Likewise, the manufacturers of energy technologies (including battery, wind and solar, as well as gas turbines) suffered from manufacturing disruptions. The rapid expansion of the battery applications in transportation, BTM building applications, and utility scale projects has created another supply chain challenge as manufacturers try to manage the competing demands from different market sectors. Supply chain disruptions and constraints are likely to continue for the foreseeable future and pose a challenge to the state's objectives of ensuring near-term reliability and achievement of SB 100 goals.

The CPUC continues to aggregate known information about project online dates to maintain a real-time perspective on how project development challenges and supply chain disruptions might impact reliability and SB 100 goals. It may be necessary for the CPUC to order LSEs to pursue a mix of resources and technologies simply to mitigate reliability risks associated with bringing new clean resources online in a timely fashion. An upcoming decision in the CPUC's IRP proceeding (R.20-05-003) on the preferred system portfolio will consider whether additional new resources are needed for the next 10 years, whether specific resource types should be procured, and whether specific actions should be taken to ensure retention of existing resources needed both for reliability and GHG emission reduction purposes.

The CPUC and the CAISO obtain project specific information through the procurement and interconnection processes, respectively. For the CPUC and CEC to effectively monitor project development progress, the agencies require detailed and consistent information that is often considered confidential during the project development stage, e.g., the project's name, interconnection point, and expected commercial operation date. Because the CAISO is not a state agency, legal barriers prevent the CPUC and CEC from sharing information with the CAISO. Any disclosure of confidential information to CAISO by a state agency may waive confidentiality designations of market sensitive information. This constraint can present an obstacle to SB 100 implementation as the confidential information includes critical energy planning information related to generation online dates.

The urgency and complexity associated with bringing new resources online also raises the question as to whether CAISO's cluster study queue approach should be revisited, as there may be approaches that focus on projects that are ready to proceed through the interconnection process that could enable swifter online dates.

Recommendations:

- Utilize the task force comprised of the joint agencies, CAISO, and GO-Biz to address barriers to realization of procured resources through tracking, identifying, and addressing issues with individual projects.
- Consider statutory changes that would allow the CPUC and CEC to disclose limited confidential information related to generation and energy storage projects with PPAs to CAISO for statewide planning purposes, but not for public release.
- Examine the CAISO's current queue practices and tariff obligations. Consider awarding transmission services to resources that are ready to proceed through the interconnection process, while considering the impact on earlier-queued projects and the long-term ramifications of such actions.

Clean Electricity Generation and Storage Project Permitting Considerations

The 2021 SB 100 Joint Agency Report highlights the need to construct utility-scale clean electricity generation and storage facilities at sustained record-setting rates. Local governments are essential partners in achieving these goals as they often have jurisdiction through their land use planning and permitting authorities for development proposed on private lands. For example, local government agencies have permitting authority for thermal projects under 50 MW and almost all projects that are photovoltaic, wind, and storage facilities, including the transmission line from the facility to the first point of interconnection with the grid.

While, renewable energy project developers and proponents cite the economic benefits, including high-quality jobs and tax revenues, as positive outcomes of these projects, utility-scale solar and wind, energy storage, and transmission lines can face permitting challenges at the local level. Local government collaboration is necessary to support, incentivize, and accelerate new clean energy projects and the necessary transmission infrastructure to transform the electricity sector to reduce GHG and air pollutant emissions and create more sustainable and resilient communities.

Recommendation:

- Create a structure that better integrates statewide electricity planning and local land use planning and permitting that recognizes the scale and pace at which clean energy projects and supporting infrastructure must be built to achieve SB 100.
- Consider statutory changes to reflect the urgency of the climate crisis and the magnitude of the need, including local financing and economic benefits, and expediting permit processes and judicial review, as well as consolidating review at the state level for essential generation, storage and transmission projects.

Transmission Planning, Permitting, and Interconnection

The build out of new transmission lines and upgrades to existing transmission lines is essential to support the interconnection of new resources. Through the SB 100 Implementation workshops, stakeholders have identified several challenges to the timely permitting and build out of transmission upgrades.

Some of the projects needed to reach our SB 100 goals will require a transmission system network upgrade. Transmission system owners have experienced issues with keeping interconnection requests and associated transmission network upgrades on schedule, in some cases leading to delays in the online dates for new generation and storage resources that would have been operational in the near term. Generation developers need certainty about transmission access to move forward on projects, while transmission developers need certainty about commercial generator interest in a specific location before moving forward with development.

The process begins with generation resource planning at the CPUC, who then transmits this information to CAISO via generation portfolios. Often, the portfolios are driven by state policy goals such as the RPS, GHG emissions reduction, increased electrification, and SB 100 goals. The CAISO studies the generation portfolio per its tariff and planning standards to assess transmission expansion projects, if any, to ensure reliable delivery of energy to load. Once the transmission upgrade is approved by the CAISO Board of Governors for cost allocation, the process moves back to the CPUC for the permit and associated environmental review for new or rebuilt high voltage transmission lines.

The vast majority of transmission upgrades are exempt from project permitting at the CPUC; typically, only extremely large projects with significant new rights of way are subject to CPUC permit and environmental review. As there can be hundreds of upgrades in development at all times, and most upgrades fall outside the CPUC's established triggers for permitting, it can be challenging to track whether specific projects are delayed and whether the transmission owners are prioritizing the upgrades needed for new generators that can provide reliability.

In addition, LSE procurement activities do not always prioritize procurement from projects that have viable and timely paths to interconnection and network upgrades. In some instances, transmission network upgrades or interconnection upgrades trigger local government and/or environmental permitting, some of which can be difficult to foresee.

To address these issues, the CPUC is working with the CAISO and Transmission Owners to establish a routinized Transmission Development Forum. While there have been ad hoc meetings hosted by CAISO, CPUC and utilities in the recent past, these entities are creating a more formalized forum so that stakeholders can gain a greater understanding of the project schedules for upcoming generators and to provide better insight into project development timelines.

To inform and support both the SB 100 effort and the CPUC's IRP process, the CAISO launched a 20-Year Transmission Outlook initiative to explore longer term grid requirements and options for meeting the state's GHG reduction and renewable energy objectives reliably and cost-effectively, leveraging the SB 100 land use information as a starting point. The initiative will engage in meaningful discussion without focusing on specific project approvals to consider long-term load forecasts with an emphasis on potential impacts from increased electrification in other sectors, broader ranges of resource transitions including potentially more aggressive gas-fired generation fleet retirement, and increased emphasis on inter-regional opportunities. This initiative is conducted in parallel with the CAISO's annual 10-year transmission planning process.

Recommendations:

- Consider policy mechanisms and project viability measures that incentivize LSE selection of projects toward areas where interconnection and transmission network upgrades have a viable and timely path forward.
- Establish a routinized process to provide transparency to the transmission network upgrades and interconnection processes.
- Identify opportunities to integrate longer term SB 100 resource planning and mapping efforts and the CAISO's 20-Year Transmission Outlook when available in 2022, with the CPUC's IRP processes and resulting procurement orders.
- Examine alignment of the CAISO transmission planning processes, CPUC integrated resource planning, and LSE procurement activities to ensure use of best available information for decision making.

Improving Long-Term Planning to Support SB 100 and Reliability

California's long-term planning is evolving to meet the changing planning needs associated with high penetrations of renewable energy and integration resources to meet SB 100 and the state's GHG emissions reduction goals.

The challenges to the electric system that led to rotating outages in 2020 and multiple Flex Alerts in 2021 continue to pose a threat to the reliability of the electric system. The CEC stack analysis for summer 2022 shows that demand may exceed available supply during critical periods of the day if the state continues to experience extreme weather events, particularly with predictions that the drought will continue into 2022.

The near-term reliability challenge is operating through the net demand peak period. The "net demand peak" is the peak of demand net of solar and wind generation resources. With today's resource mix, solar generation declines in the late afternoon at a faster rate than demand decreases. The steep ramp in demand is due to air conditioning and other loads served by solar during the day needing a replacement source of electricity as solar generation drops to zero. These changes in the resource

mix and the timing of the net peak have increased the challenge of maintaining system reliability, and this challenge is amplified during an extreme heat event.

As California moves towards its clean energy goal, the joint agencies will need to continue to adapt their planning to best account for changes to demand due to climate change and increased electrification of vehicles and buildings, and to the resource mix to ensure reliability as the state both adapts to and mitigates climate change.

Analytical Enhancements to Reflect Climate Change Impacts

The reliability events in 2020 and 2021 highlighted the need to carefully consider climate impacts within procurement and reliability assessments. The CEC is adapting and developing new analytical products to support planning activities in order to plan for climate-induced demand and supply uncertainties. The California Energy Demand forecast is being further enhanced to capture the frequency and dispersion of extreme climate impacts. In response to the RCA, the CEC has also developed two classes of reliability assessments which will be included in an annual California Reliability Outlook that incorporates relevant procurement, market, and policy considerations.

Additionally, through the 2021 SB 100 Joint Agency Report and SB 100 Implementation workshops, stakeholders requested consideration of DER scenarios, careful treatment of non-energy benefits and more comprehensive reliability analysis in SB 100 planning. Through the SB 100 report planning, the joint agencies will continue to update 10-to-25-year planning methodologies and assumptions to inform pathways to meeting the SB 100 targets.

Recommendation:

- Incorporate climate impacts and reliability assessments into near-, mid- and long-term planning studies.

Ongoing Resource Adequacy Program Enhancements to Support Reliability

In addition to ongoing program enhancements in July 2021, the CPUC indicated that it will consider significant modifications that may restructure the Resource Adequacy program so that the program will require LSEs to focus their procurement planning efforts to serve load across all hours of the day.[7] These reforms are being considered expressly to resolve net-peak load concerns that are expected to intensify as the state moves towards a future with increasingly higher penetration of

7 The current system resource adequacy requirements are established based on monthly LSE peak demand.

variable renewable resources to fulfill the SB 100 mandate. These reforms are likely to affect program implementation for the 2024 compliance year.

Adapting State Planning to Support SB 100 and Reliability

While the CPUC's Resource Adequacy program focuses on ensuring the existing resources are available to grid operators, the CPUC's IRP proceeding implements the requirements of SB 350 (De León, Chapter 547, Statutes of 2015) through planning, procurement, and compliance instruments with the overarching objective to ensure that LSEs procure sufficient resources to meet GHG planning targets for the electric sector, set by CARB, through an optimal mix of resources, while ensuring reliability, affordability, and other policy goals. As noted above, the CPUC has issued numerous orders focused on ensuring LSEs meet procurement obligations for new resources needed for reliability.

The CPUC applies specific long-term planning criteria when analyzing the sufficiency of the existing contracted and planned resources to meet reliability standards. Given the changing mix of resources and grid conditions, the planning standards may also need to be updated to ensure reliability and alignment with SB 100 goals.

Recommendation:

- Use long term planning processes, IEPR, IRP, TPP and Scoping Plan to achieve SB 100 goals and support grid reliability.

Retail Choice Impacts

Long-term resource planning and procurement responsibility has shifted with the rise of Community Choice Aggregators and Direct Access providers (ESPs) serving load. Investor-owned utilities went from serving, and planning for, approximately 87 percent of customer load to serving 60 percent of load in IOU territories. The remaining load is now served by Community Choice Aggregators and Direct Access providers. There are now 44 different LSEs serving load under the jurisdiction of the CPUC. Prior to SB 350, the CPUC imposed planning and procurement obligations on the IOUs with cost allocation to all benefiting load. Starting in 2019, the CPUC began to require all LSEs, including CCAs and ESPs, to procure new capacity needed for reliability.

CCAs and ESPs are willing and generally able to procure new resources, but the fragmentation of the retail market introduces several risks for long-term resource planning in California. As the number of procurement entities increases, there is a greater risk that LSEs will collectively fail to bring on sufficient resources to serve load, and that there will be little time between realization of this shortfall and the actual planning year. Also, there is a possible challenge that LSEs will not procure an optimal set of clean energy resources – in terms of total cost to ratepayers, operational or locational attributes, or least cost integration with the existing transmission system.

Coordinating the IRP, RA and RPS procurement requirements for 44 separate entities creates far greater complexity for ensuring reliability.

The risks highlighted here need to be closely monitored by the energy agencies, as they present a potential risk to reliability and realizing the achievable but unprecedented increase in clean energy generation and energy storage projects needed to replace the fossil-fueled resources that currently help maintain system reliability.

Rate Impacts

As we progress towards achieving SB 100 the affordability of utility electric bills will be critical to consider. The path toward SB 100 must include all Californians, and to accomplish this, electricity rates are critically important. California retail electricity rates are relatively high compared to other states, even before incorporating costs associated with recent wildfires, future climate-induced risks, utility wildfire mitigation investments, and implementation of important policy goals, including California's critical GHG emissions reduction targets.

Earlier this year, the CPUC released a white paper,[8] "Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1" (White Paper), to support the February 24, 2021, Energy Rates and Costs En Banc. The White Paper states that the CPUC faces multiple intersecting policy mandates that, if handled incorrectly, could result in rate and bill increases that would make other policy goals more difficult to achieve and could result in overall energy bills becoming unaffordable for some Californians. Upfront costs to enable electrification and wildfire mitigation planning are among the near-term needs, for example, that place upward pressure on rates and bills. Any capital investments made by IOUs also include a rate of return, which drives up costs. Additionally, the state turns to ratepayers to fund public purpose programs and clean energy development, resulting in fixed costs that are allocated to customers based on the volume of electricity used.[9] While capital investments by LSEs will be necessary to ensure reliability and meet California's climate policy goals, they can also result in higher bills for customers.

The 2021-2030 overall bundled residential rate forecasts for the three large California electric utilities are expected to grow at a pace that exceeds inflation for many years in the coming decade. For high energy usage households in hot climate zones served

8 Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1. California Public Utilities Commission. 2021. Available at https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf.

9 Note that modeling for the 2021 SB 100 Joint Agency Report assumes that the current rooftop solar net energy metering (NEM) rate will be reduced in the current CPUC NEM proceeding. If the solar NEM rate is not changed, rates for non-rooftop solar customers will be higher than reflected in the report models.

by the three large electric utilities, monthly energy costs (including electric rates plus natural gas and gasoline costs) are projected to rise at a pace that exceeds inflation at an even steeper rate.

New economic and regulatory framework models that consider the societal and environmental costs and benefits of necessary reliability, resiliency and emission reduction investments may be needed to move beyond systematically passing through to ratepayers the social or environmental costs to meet the state's mandates to reduce carbon emissions, and to address the risks of climate change.

New Financing Mechanisms and Rate Designs to Address Affordability Impacts

The equitable transition to carbon-free energy will require significant costs, traditionally funded by ratepayers. Implementation of the state's climate and energy targets provides societal and environmental benefits that should be considered in the cost allocation of these initiatives. For example, preliminary analysis from the 2021 SB 100 Joint Agency Report shows that reaching the SB 100 2045 targets would result in estimated avoided social costs ranging from approximately $900 million to $3.5 billion, depending on the discount rate. Similarly, wildfire mitigation measures provide critical climate change adaptation benefits to residents from various areas of the state. The payback on significant investments made today will occur over future decades in the form of avoided higher damages from climate change.

Shifting the cost burden of societal and environmental impacts away from ratepayers could better facilitate decarbonization and improve overall equity. New financing methods may also support more progressive cost-recovery and better matching between cost allocation, future risk, and benefit.

The CPUC's 2021 Senate Bill 695 (Lara, Chapter 838, Statutes of 2018) Report summarizes proposals for alternate cost-recovery and rate-reform methods. These include proposals made by panelists at the CPUC's February 24th Energy Rates and Costs En Banc, as well as recommendations from stakeholders submitted through a public comment process following the hearing. These recommendations provide a range of options for the CPUC and other state agencies to consider, though some of the proposals would require legislative action.[10] These options include, but are not limited to the following:

- **Funding programs with societal benefits through non-ratepayer funds**
  Certain climate change initiatives, wildfire and infrastructure spending with societal benefits could be better funded through non-ratepayer sources.

- **Publicly-financing or owning transmission assets**

10 Assigned Commissioner's Fourth Amended Scoping Memo and Ruling in Rulemaking 18-07-006. 15 September 2021. Available at https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M407/K793/407793995.PDF.

Creating a new entity to finance or build some transmission projects could reduce the long-term cost and bill impacts of the movement to a 100 percent carbon free grid by reducing the costs of new transmission projects. Over the past 10 years the cost of transmission for the average California ratepayer has increased by over 150 percent. Much of this increase is driven by large transmission projects. One approach would be to create a California transmission authority as a new public benefits corporation that can either on its own, or through public private partnerships, fund and build new transmission projects needed to meet clean energy goals. The transmission authority could be modeled on the New York Power Authority, which owns significant transmission assets in New York state.

- **Review Residential Rate Design**
  Consider residential rate reforms to improve affordability outcomes, possibly including income-based fixed charges.

Recommendations:

- Identify funding sources other than ratepayer monies to fund electric sector programs with societal benefits.
- Consider statutory changes for the formation of a new entity for energy and transmission financing.
- Explore statutory changes and regulatory mechanisms to reduce rate pressure on low- and moderate- income ratepayers.

Considerations for Long Lead-Time Resources

Long lead-time and emerging resources are expected to play an important role in supporting reliability as the state moves closer to the 2045 SB 100 target. Long lead-time resources include existing technologies that have a longer development cycle like geothermal, biomethane, and emerging technologies that need additional development, demonstration, and cost reduction to be broadly deployed, such as renewable hydrogen, offshore wind, and long-duration energy storage.

Realizing the potential of long lead-time resources requires overcoming a range of challenges. For many of these resources, technology development timeframes to commercialization could be significant. This includes achieving market-ready performance, cost competitiveness, system durability, and safety. In the case of hydrogen fuel cells and biomass generation, for example, elevated cost remains a key barrier to increased deployment. Another example is renewable hydrogen combustion generation, where research is needed to demonstrate performance, reduce cost, and limit criteria air pollutants.

Emerging Resources to Meet Long-Term Reliability Needs

Characterizing the reliability needs in the 10-to-25-year timeframe is critical to identify the long lead-time and emerging resource need. These resources have pathways that

require advanced planning and may require identification and incorporation into standard planning timeframes in order to avoid decision-making that may eliminate particular resource pathways that may be more expensive in the near-term, but ultimately a more cost-effective long-term pathway.

Multiple factors provide challenges to adequately assessing the long-term reliability outlook compared to our traditional planning tools. The combination of high levels of variable renewable energy resources in combination with electrification leading to increased winter loads, creates a risk of winter "dark doldrum" events, in which there are multiple days or weeks of low renewable energy generation due to lack of wind and sunlight. While these types of reliability events are not foreseen in the near-term, reliability analysis and planning will need to continue to evolve to characterize these events and resulting needs.

It is anticipated that emerging resources, particularly zero-carbon resources that can produce energy on demand, often termed "zero-carbon firm," will be needed to support the grid during these types of reliability events. In addition to better characterizing the long-term reliability need, it is equally essential for planning efforts to characterize the attributes of emerging resources to determine resource pathways to the long-term clean energy goals that balance cost, risk, reliability, and resiliency. Through the SB 100 interagency planning process, the agencies will continue to characterize the long-term reliability need and evaluate resource pathways to meet those needs.

Recommendations:

- Improve existing data collection efforts and analysis to inform future analyses and track progress towards achieving SB 100.
- Utilize SB 100 interagency process to facilitate long lead-time resource pathways to inform long-term planning decisions.

Procurement of Long Lead-Time Resources

At a system level, a large, long lead-time resource may be found to be the optimal resource option. Modeling results within the planning track of the CPUC's IRP proceeding indicate that a significant amount of long lead-time, large-scale, pre-commercial technologies, and some new generation resources dependent on new transmission, are highly likely to be required to meet California's resource needs. While the CPUC has ordered 2,000 MW of long lead-time resources (in D. 21-06-035), ordering LSEs to contract for long lead-time resources can be challenging because the costs likely go beyond the ability of a single entity to fund, and the large amounts of MWs are beyond the needs of their customers. Out-of-state resources face unique challenges in addition to those already described for long lead-time resources such as, coordinating with transmission owners in other states, comparing the costs and benefits of these resources to in-state resources, and reliance on new transmission, itself another long-lead time resource.

Recommendation:

- Consider statutory and regulatory changes to create a central procurement entity or a new cost-recovery mechanism to secure the development for certain large, long-lead time resources.

Advancing Responsible Offshore Wind Energy Development

Offshore wind is an attractive technology from a system planning perspective due to the associated generation potential profile that complements solar, with higher output in the evenings, when electricity demand is high and solar production is low. Offshore wind also complements solar seasonally and can provide more consistent output during winter months when solar production is lower. However, offshore wind energy development has unique challenges associated with being sited offshore. The 2021-22 Budget included funding for an interagency approach to offshore wind energy focused on the immediate needs of state agencies to fulfill their responsibilities of assessing offshore wind energy in federal waters. The CEC, the Ocean Protection Council, the California Coastal Commission, the California Department of Fish and Wildlife, the State Lands Commission, and the CPUC will conduct environmental and energy system related assessments to inform near-term regulatory decisions. The agencies are beginning to make investments in environmental assessments of potential areas for offshore wind energy off the California coast to evaluate proposed lease areas under the Coastal Zone Management Act (CZMA). This will include outreach to coastal communities, the fishing industry, tribes, and other ocean and coastal stakeholders to assess the potential impacts of offshore wind energy. The CPUC is continuing to evaluate offshore wind energy in the IRP proceeding and the CAISO is analyzing the transmission needs associated with 8 gigawatts of offshore wind energy as a sensitivity study and about 18 gigawatts in a special outlook study as part of its 2021-2022 transmission planning process. The state's approach to assessing the environmental and energy system related information for offshore wind energy in federal waters can add certainty to project development to pursue federal tax credits.

Assembly Bill 525 (Chiu, 2021) was signed into law on September 23, 2021 and directs the CEC to collaborate with other state agencies to develop a strategic plan for offshore wind energy. AB 525 becomes effective on January 1, 2022 and requires the CEC complete the strategic plan by June 30, 2023.

Recommendation:

- Continue the interagency approach to preparing for near-term state actions to assess offshore wind energy and creating a strategic plan for offshore wind energy that is inclusive of stakeholder and tribal perspectives and advances the technology responsibly.

Funding Technology Development and Demonstration

Funding technology innovation is essential to developing new and emerging resources to meeting the SB 100 targets. California is investing in technology innovation for a portfolio of long lead-time resources through programs such as the Electric Program Investment Charge (EPIC) Program and Natural Gas Research and Development (R&D) Program. These programs fund innovators and researchers to advance technologies, improving performance, installation and operating costs, and deployment readiness. For example, for offshore wind, existing EPIC initiatives focus on technology developments to improve cost and operational efficiency as well as assessment and mitigation of potential environmental impacts. Research initiatives under the EPIC and the Natural Gas R&D Program are advancing renewable hydrogen technology development, including production, storage, and power generation applications. Lastly, there is still a learning curve involved with newer technologies, as shown by the recent battery module overheating which affected a newly energized 300-megawatt facility.[11]

Funding long-term grid-level storage is critical to the success of California's efforts to decarbonize its energy system. The state must deploy innovative storage on various parts of the grid to provide critical capacity and grid services and to identify which long duration technologies work best in different applications. Incentives to deploy long-duration storage technologies on the verge of commercialization would support scale-up and help move these technologies from demonstration-scale to commercial deployment.

Funding is also needed to advance renewable hydrogen technology. This includes technology demonstrations to help scale the generation and production of renewable hydrogen and the blending of hydrogen with natural gas for use in existing power plants, with a goal of reaching a 50 percent renewable hydrogen blend and controls to limit NOx emissions from renewable hydrogen combustion.

Recommendation:

- Consider funding sources other than ratepayer monies for zero-carbon emerging technologies, including long-duration energy storage and renewable hydrogen production, to accelerate the deployment and scale up of these resources.

Maximizing Demand Response and Demand Flexibility

Demand response and demand flexibility are key resources in accelerating the transition to a zero-carbon energy future. Demand response and demand flexibility can either reduce or shift electric loads to another time of the day in response to

11 Edward Klump (E&E News. Energy Wire). 2021. Major California battery outage highlights energy storage risks. Available at https://www.eenews.net/articles/major-calif-battery-outage-highlights-energy-storage-risks.

incentives, rates, or emergency notifications. Such resources are critical to maintaining electric reliability when peak and net peak usage are higher than anticipated and there is not enough electricity supply to meet that demand. Market-integrated demand response is a carbon-free supply-side resource, but accounting for this resource is complicated, particularly in determining how much can be counted toward system reliability. Improved accounting is needed to maximize this resource and appropriately incorporate demand response into planning for system reliability. Besides helping keep the grid reliable, demand response and demand flexibility also help advance the objectives of SB 100 by reducing the state's reliance on fossil-fuel resources and by enabling load to increase when there is an overabundance of renewable energy available.

The joint agencies and CAISO have taken multiple actions to increase demand flexibility and the amount of demand response that can be counted on for system reliability. These actions include:

- Initiating the Emergency Reliability rulemaking (R.20-11-003), where the CPUC took several actions to increase demand response capacity in anticipation of grid needs for the summer of 2021, including implementation of the Emergency Load Reduction Program (ELRP).
- Pursuing additional demand response actions in preparation for the summer of 2022 to strengthen electric reliability. Proposals have included changes to ELRP to increase participation, particularly for EV aggregation, additional Demand Response Auction Mechanism (DRAM) auctions, new rules to improve DRAM performance, an agricultural demand flexibility pilot, and changes to smart thermostat programs to better leverage these devices for demand response and energy efficiency.
- Initiating the process to develop Load Management Standards that will require California's five largest LSEs[12] to develop rate programs to encourage demand flexibility and make the rate information available to customers and services providers.
- Development of the Market Informed Demand Automation Server (MIDAS) system, a statewide real-time signaling system that collects time-varying electricity rates, CAISO Flex Alerts, and marginal greenhouse gas emissions data, and shares that information via a signal to utilities, aggregators and/or homeowners.
- Highlighting actions in the CPUC's DER Action Plan 2.0 to improve demand-side resource management through more effective integrated demand response and retail rate structures that promote widespread, scalable, and flexible load strategies enabled by electrification and DER deployment opportunities. A

12 PG&E, SCE, LADWP, SMUD and SDG&E.

CPUC rulemaking on load flexibility and rates is expected before the end of 2021.

- Launching an effort to enable more accurate accounting for supply-side demand response and provide insights to longer-term priority actions to maximize demand response as a supply-side resource.[13]

Recommendation:

- Continue coordination efforts between the agencies and proceedings to maximize the opportunities with demand response and demand flexibility.

Regional Markets

As California moves to higher levels of renewable energy penetration, increasing coordination across the western electric grid through the Extended Day Ahead Market (EDAM) could provide several significant benefits, including lowering system costs, reducing GHG emissions, and enhancing reliability.

The CAISO currently operates a Western energy imbalance market (EIM) which by 2023 will include 22 entities representing 84% of the load within the Western Electricity Coordinating Council. During the extreme heat events in August and September 2020 and again in summer 2021, the 15 participants across 10 states in the Western EIM proved to be valuable partners in sharing energy resources during stressed grid conditions.

The EIM also provides economic and operational efficiencies. In July 2021, the CAISO reported gross financial benefits of $1.42 billion among the 15 participating regional balancing authorities since the start of the Western EIM in 2014.[14] The economic benefits of EIM result from the real-time efficient use of transfer capability to facilitate the transfer of surplus energy in one balancing area to displace higher-cost energy in another balancing area participating in in the EIM. The benefits also result in reduced GHG emissions when clean surplus renewable energy that otherwise would have been curtailed is used to displace higher-emitting resources in other areas. Finally, while the EIM does not create new capacity, the EIM has proven to enhance reliability by optimally using available capacity to serve demand where and when it is needed during stressed system conditions.

The CAISO also continues to improve upon coordination, transmission usage, and market dispatch with neighboring balancing authorities and states and pursue additional opportunities for EIM participants. To that end, the CAISO is preparing to

13 Decision Adopting Local Capacity Obligations for 2022-2024, Flexible Capacity Obligations for 2022, and Refinements to the Resource Adequacy Program. California Public Utilities Commission. 2021. Available at https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M389/K603/389603561.PDF.

14 Western EIM Benefits Report Second Quarter 2021. California Independent System Operator. 2021. Available at https://www.westerneim.com/Documents/ISO-EIM-Benefits-Report-Q2-2021.pdf.

restart an open stakeholder initiative to extend participation in the day-ahead market to the Western EIM entities in a framework similar to the existing EIM approach for the real-time market, rather than requiring full integration into the CAISO balancing area. The CAISO and CARB will also continue to ensure accurate accounting of GHG emissions, including minimizing the potential for emissions leakage and ensuring resource shuffling is not occurring under regionalization. An EDAM will improve market efficiency by integrating renewable resources using day-ahead unit commitment, optimizing transmission use in the day ahead market, and scheduling across a larger area.

In the stakeholder initiative effort, the CAISO has established initial common guiding principles and conceptual design elements and will host an "EDAM Forum" on October 13, 2021. The CAISO will also launch a stakeholder process to begin additional collaborative discussions on the EDAM policy design to build strong consensus and commitment toward further progress in the year ahead.

The current EIM market accounts for less than 10 percent of the energy transactions in the CAISO's real-time market, meaning additional measures could significantly amplify its benefits. In the future, the state may consider full regionalization to allow the state to meet several policy objectives, such as reliably and efficiently integrating high penetrations of renewable energy, by allowing California and the west greater load and supply diversity and reducing system costs. Regionalization could also allow the CAISO to better plan for and develop more effective regional transmission projects.

Recommendations:

- Support the CAISO's implementation of the Extended Day Ahead Market.
- Continue to explore the benefits of regionalization to enhance reliability, affordability, and decarbonization.

Alignment with Federal Efforts

As California and the federal government continue progress on shared climate and energy commitments, the joint agencies and CAISO should continue to align and leverage state and federal efforts. Federal agencies have planning and permitting responsibilities for clean energy projects sited on federal public lands and their support will be needed to incentivize and accelerate new clean energy projects and the needed transmission infrastructure. One of the areas where the federal government is demonstrating leadership is in the development of the federal Clean Energy Standard (CES). California should continue to engage on the development of the CES to ensure that early adopters for the state's RPS are not inadvertently penalized and that it accelerates progress toward a cleaner, reliable, and affordable energy system for Californians and the nation.

Another major opportunity to bolster California's efforts in accelerating the transition of its energy system is the American Jobs Plan. The Plan allocates approximately $65

billion to rebuild the nation's electric grid, build critical new transmission lines, and expand renewable energy.

Finally, California should continue to coordinate closely with the Western Area Power Administration (WAPA). WAPA's Transmission Infrastructure Program manages the $3.25 billion revolving loan program; a unique federal financing program with a core congressional mandate to support the development of programs that facilitate and optimize the delivery of reliable, affordable power generated by clean energy resources. WAPA will play a significant role in coordinating and funding transmission expansion in the western interconnection and presented its commitment to investing in a stronger grid of the future at the CEC's workshop.[15]

Recommendation:

- Coordinate efforts to maximize opportunities for federal support of investment in California.
- Pursue an agreement between key state and federal agencies to collaborate on clean energy project planning and permitting on federal public lands.

15 Joint Agency Workshop on "Next Steps to Plan for Senate Bill 100 Resource Build – Transmission" on July 22, 2021.

Summary of Recommendations

Challenge	Issue	Proposed Recommendation(s)
Challenges to Realization of Procurement	Potential Supply Chain and Project Development Impacts	• Utilize the task force comprised of the joint agencies, CAISO, and GO-Biz to address barriers to realization of procured resources through tracking, identifying, and addressing issues with individual projects. • Consider statutory changes that would allow the CPUC and CEC to disclose limited confidential information related to generation and energy storage projects with PPAs to CAISO for statewide planning purposes, but not for public release. • Examine the CAISO's current queue practices and tariff obligations. Consider awarding transmission services to resources that are ready to proceed through the interconnection process, while considering the impact on earlier-queued projects and the long-term ramifications of such actions.
Challenges to Realization of Procurement	Clean Electricity Generation and Storage Project Permitting Considerations	• Create a structure that better integrates statewide electricity planning and local land use planning and permitting that recognizes the scale and pace at which clean energy projects and supporting infrastructure must be built to achieve SB 100. • Consider statutory changes to reflect the urgency of the climate crisis and the magnitude of the need, including local financing and economic benefits, and expediting permit processes and judicial review as well as consolidating review at the state level for essential generation, storage and transmission projects.

Challenge	Issue	Proposed Recommendation(s)
Challenges to Realization of Procurement	Transmission Planning, Permitting, and Interconnection	• Consider policy mechanisms and project viability measures that incentivize LSE selection of projects toward areas where interconnection and transmission network upgrades have a viable and timely path forward. • Establish a routinized process to provide transparency to the transmission network upgrades and interconnection processes. Propose solutions to address any identified barriers. • Identify opportunities to integrate longer term SB 100 resource planning and mapping efforts and the CAISO's 20-Year Transmission Outlook when available in 2022, with the CPUC's IRP processes and resulting procurement orders. • Examine alignment of the CAISO transmission planning processes, CPUC integrated resource planning, and LSE procurement activities to ensure use of best available information for decision making.
Improving Long Term Planning to Support SB 100 and Reliability	Analytical Enhancements to Reflect Climate Change Impacts	• Incorporate climate impacts and reliability assessments into near-, mid- and long-term planning studies.
-	Adapting State Planning to Support SB 100 and Reliability	• Use long term planning processes, IEPR, IRP, TPP and Scoping Plan to achieve SB 100 goals and support grid reliability.
Rate Impacts	New Financing Mechanisms and Rate Designs to Address Affordability Impacts	• Consider statutory changes for the formation of a new entity for energy and transmission financing. • Explore statutory changes and regulatory mechanisms to reduce rate pressure on low- and moderate- income ratepayers. • Identify funding sources other than ratepayer monies to fund electric sector programs with societal benefits.

Challenge	Issue	Proposed Recommendation(s)
Considerations for Long Lead-Time Resources	Emerging Resources to Meet Long-Term Reliability Needs	• Improve existing data collection efforts and analysis to inform future analyses and track progress towards achieving SB 100. • Utilize SB 100 interagency process to facilitate long lead-time resource pathways to inform long-term planning decisions.
Considerations for Long Lead-Time Resources	Procurement of Long Lead-Time Resources	• Consider statutory and regulatory changes to create a central procurement entity or a new cost-recovery mechanism to secure the development path for certain large, long-lead time resources.
Considerations for Long Lead-Time Resources	Advancing Responsible Offshore Wind Energy Development	• Continue the interagency approach to preparing for near-term state actions to assess offshore wind energy and creating a strategic plan for offshore wind energy that is inclusive of stakeholder and tribal perspectives and advances the technology responsibly.
-	Funding Technology Development and Demonstration	• Consider funding sources other than ratepayer monies for zero-carbon emerging technologies, including long-duration energy storage and renewable hydrogen production, to accelerate the deployment and scale up of these resources.
Maximizing Demand Response and Demand Flexibility	-	• Continue coordination efforts between the agencies and proceedings to maximize the opportunities with demand response and demand flexibility.
Regional Markets	-	• Support the CAISO's implementation of the Extended Day Ahead Market. • Continue to explore the benefits of regionalization to enhance reliability, affordability, and decarbonization.

Challenge	Issue	Proposed Recommendation(s)
Alignment with Federal Efforts	-	• Coordinate efforts to maximize opportunities for federal support of investment in California. • Pursue an agreement between key state and federal agencies to collaborate on clean energy project planning and permitting on federal public lands.

GLOSSARY

Word and Acronym	Definition
California Independent System Operator (CAISO)	A non-profit Independent System Operator and Balancing Authority serving 80 percent of California load and a small part of Nevada.
California Air Resources Board (CARB)	The "clean air agency" in the government of California, whose main goals include attaining and maintaining healthy air quality; protecting the public from exposure to toxic air contaminants; and providing innovative approaches for complying with air pollution rules and regulations.
Community Choice Aggregator (CCA)	An alternative to the investor-owned utility energy supply system in which local entities in the United States aggregate the buying power of individual customers within a defined jurisdiction in order to secure alternative energy supply contracts.
California Energy Commission (CEC)	The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy.

Word and Acronym	Definition
California Public Utilities Commission (CPUC)	A state agency created by constitutional amendment in 1911 to regulate the rates and services of more than 1,500 privately owned utilities and 20,000 transportation companies. The CPUC is an administrative agency that exercises both legislative and judicial powers; its decisions and orders may be appealed only to the California Supreme Court. The major duties of the CPUC are to regulate privately owned utilities, securing adequate service to the public at rates that are just and reasonable both to customers and shareholders of the utilities; including rates, electricity transmission lines and natural gas pipelines. The CPUC also provides electricity and natural gas forecasting, and analysis and planning of energy supply and resources. Its main headquarters are in San Francisco.
Demand Response Auction Mechanism (DRAM)	DRAM is a procurement mechanism designed to gain experience with bidding aggregated demand response directly into the wholesale California ISO market.
Extended Day Ahead Market (EDAM)	EDAM will extend participation in the day-ahead market to the Western Energy Imbalance Market (EIM) entities in a framework similar to the existing EIM approach for the real-time market, rather than requiring full integration into the CAISO balancing area. EDAM will improve market efficiency by integrating renewable resources using day-ahead unit commitment and scheduling across a larger area.
Energy imbalance market (EIM)	A real-time wholesale energy trading market, the first of its kind in the western United States.

Word and Acronym	Definition
Emergency Load Reduction Program (ELRP)	A pilot program designed to allow the state's investor-owned utilities (IOUs) to rely on additional reductions in electric demand during times of peak usage when there may be limited generation available. Participation in ELRP is voluntary and is an energy-only pay-for-performance program that is outside of the CAISO market.
Federal Energy Regulatory Commission (FERC)	An independent regulatory commission within the U.S. Department of Energy that has jurisdiction over energy producers that sell or transport fuels for resale in interstate commerce; the authority to set oil and gas pipeline transportation rates and to set the value of oil and gas pipelines for ratemaking purposes; and regulates wholesale electric rates and hydroelectric plant licenses.
Integrated Energy Policy Report (IEPR)	Provides policy recommendations to conserve resources, protect the environment, ensure reliable, secure, and diverse energy supplies, enhance the state's economy, and protect public health and safety.
Investor-owned utility (IOU)	A private company that provides a utility, such as water, natural gas or electricity, to a specific service area. The investor-owned utility is regulated by the California Public Utilities Commission.

Word and Acronym	Definition
Integrated Resource Planning (IRP)	A public planning process and framework within which the costs and benefits of both demand- and supply-side resources are evaluated to develop the least-total-cost mix of utility resource options. In many states, IRP includes a means for considering environmental damages caused by electricity supply/transmission and identifying cost-effective energy efficiency and renewable energy alternatives.
Load serving entity (LSE)	Formed by a local electricity generation system, storage system, and renewable energy resources, which can provide ancillary services to customers and the utility grid.
Market Informed Demand Automation Server (MIDAS)	A database of current and future time-varying rates, greenhouse gas emissions associated with electrical generation, and California Flex Alert Signals hosted by the California Energy Commission.
Mid-term reliability (MTR)	The Mid Term Reliability analysis is a stochastic analysis that draws upon a distribution of future demand profiles, historic wind and solar profiles, and randomized forced outages to determine a probability for a supply shortfall, given what resources are expected to be connected to the grid.
Megawatt (MW)	Equivalent to 1,000 kilowatts or 1,000,000 watts. The measurement is usually used as a means of expressing the output of power plants, or the amount of electricity that is needed to power a city.

Word and Acronym	Definition
Net qualifying capacity (NQC)	Each resource is assigned a NQC value, which defines the amount of RA that it can sell. For intermittent resources like wind and solar, this value is typically well below the nameplate capacity of the facility, reflecting the probability that they will be generating at the time of the system peak.
Pacific Gas and Electric (PG&E)	An electric and natural gas utility serving the central and northern California region.
Power Purchase Agreement (PPA)	A contract between two parties, one which generates electricity (the seller) and one which is looking to purchase electricity (the buyer).
Public Record Act (PRA)	The California Public Records Act was a law passed by the California State Legislature and signed by then-governor Ronald Reagan in 1968 requiring inspection or disclosure of governmental records to the public upon request, unless exempted by law.
Return on equity (ROE)	Return on equity (ROE) is a financial performance metric that shows how profitable a company is.
Renewables Portfolio Standard (RPS)	The Renewables Portfolio Standard (RPS) is one of California's key programs for advancing renewable energy. The program sets continuously escalating renewable energy procurement requirements for the state's load-serving entities.
Senate Bill 100 (De León, Chapter 312, Statutes of 2018) (SB 100)	Established a landmark policy requiring renewable energy and zero-carbon resources supply 100 percent of electric retail sales to end-use customers by 2045.

Word and Acronym	Definition
Southern California Edison (SCE)	An electric utility serving the southern California region.
San Diego Gas and Electric (SDG&E)	An electric and natural gas utility serving the San Diego, California, region.
Transmission Planning Process (TPP)	CAISO's tariff-mandated annual process to provide a comprehensive evaluation of the CAISO transmission grid to address grid reliability requirements, identify upgrades needed to successfully meet policy goals, and explore projects that can bring economic benefits to consumers.
Western Electricity Coordinating Council (WECC)	WECC promotes bulk power system reliability and security in the Western Interconnection. WECC is the Regional Entity responsible for compliance monitoring and enforcement and oversees reliability planning and assessments. In addition, WECC provides an environment for the development of Reliability Standards and the coordination of the operating and planning activities of its members as set forth in the WECC Bylaws.