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California Energy Commission

FINAL COMMISSION REPORT

Clean Energy Reliability Investment Plan

Gavin Newsom, Governor
March 2023 | CEC-200-2023-003-CMF

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ABSTRACT

The *Clean Energy Reliability Investment Plan* (CERIP) addresses a requirement in Senate Bill 846 (Dodd, Chapter 239, Statutes of 2022) for the California Energy Commission to develop a $1 billion investment plan for clean energy resources. This plan provides justification and recommendations for clean energy investments that accelerate the deployment of clean energy resources, support demand response, assist ratepayers, and increase energy reliability. The plan takes into account California's anticipated supply and demand needs for near-term and mid-term reliability, advancement of the state's policies towards 100 percent zero-carbon and renewable energy resources by 2045, and the state's greenhouse gas emissions reduction targets for the electricity sector.

Keywords:

Clean energy investments, system reliability, Clean Energy Reliability Investment Plan, demand-side resources, supply-side resources

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EXECUTIVE SUMMARY

California is experiencing a substantial shift in conditions affecting the electric grid, which is transitioning to the state's clean energy future while confronting the impacts of climate change. This is creating resilience and affordability challenges for its residents, especially disadvantaged and low-income communities. Senate Bill 100 (De León, Chapter 312, Statutes of 2018) (SB 100) sets an ambitious target of powering all retail electricity sold in California with renewable and zero-carbon resources by 2045 to reduce greenhouse gas emissions and improve air quality and public health. The actions to achieve SB 100 require unprecedented quantities of clean energy resources, primarily solar and storage at utility scale. CERIP investments in demand-side resources, which is the largest single funding pool, will leverage general fund dollars to help emerging demand side programs with the potential for providing demand reductions at scale in future years. The CEC is proposing that these demand-side initiatives be informed by engagement with community-based organizations to ensure that they are meeting community needs, including affordability resilience. Funding of supply-side initiatives will help to achieve economies of scale and coordinated procurement, which can be more efficient.

At the same time, climate change is causing substantial variability in weather patterns and an increase in climate-driven natural disasters, resulting in more challenges to grid reliability. In 2020, a west-wide heat event resulted in rotating power outages August 14 and 15. In 2021, dry conditions resulted in a wildfire in Oregon that impacted transmission lines that California depends on for reliability, resulting in a loss of 3,000 megawatts (MW) of imports to the California Independent System Operator (California ISO) territory and 4,000 MW of overall import capacity to the state. In 2022, California experienced record-high temperatures between August 31 and September 9. On September 6, 2022, California ISO recorded a new record peak load at 52,061 MW, nearly 2,000 MW higher than the previous record, despite significant efforts to reduce load during this peak period.

In Senate Bill 846 (Dodd, Chapter 239, Statutes of 2022), the California Energy Commission (CEC) was asked to develop a plan to invest in "programs and projects that would accelerate the deployment of clean energy resources, support demand response, assist ratepayers, and increase energy reliability." This result of that ask is the Clean Energy Reliability Investment Plan (CERIP).

California's Reliability Challenges

Climate change, which is resulting in greater weather variability and natural disasters, is creating real challenges for the expansion of clean energy resources in California. This interaction presents three challenges for the state:

- Planning: Timely and effective planning is the essential first step in guiding electric system reliability. Existing approaches to reliability modeling are not well-equipped to account for climate change, as each year sees more weather patterns diverge from historical norms. Planning models and approaches need to be enhanced to account for greater weather variability. The state will benefit from updated planning strategies that bring these resources online faster and at a larger scale. Lastly, the needs of communities differ and the state will benefit from a greater understanding of these needs, particularly for customers in tribal, disadvantaged, and low-income communities. This entails engaging more closely with communities to find solutions that meet their needs.

- Clean Resource Scale: Although the state is experiencing a boom in new project development, challenges remain to achieving the scale and diversity of resources necessary for the transition. Supply chain disruptions for solar and storage could continue and a more diverse portfolio of resources is needed to reduce the risk from unexpected project delays. Alternative technologies are generally more expensive until they reach scale and would benefit from incentives or cost-sharing strategies to achieve greater diversity in the near term. As electrification expands, new strategies are needed to increase demand flexibility, support affordability, and increase local reliability.
- Extreme Events: Extreme heat events and wildfires remain a threat to grid reliability and can strain the grid for days or weeks. The Strategic Reliability Reserve was developed in 2022 to expand the resources capable of managing or reducing net-peak demand during extreme events. With greater risk of extreme events, more efforts may be necessary to support grid reliability.

Critical Investment Priorities

Through extensive analysis and stakeholder engagement, the following priorities for CERIP Investment have been identified.

- Planning and Enabling Structures to Support Clean Energy Deployment: The CEC, California Public Utilities Commission (CPUC), and California ISO are working to better incorporate climate change into energy planning and procurement. Additional resources and efforts need to be applied to planning the transmission capacity necessary for the transition such as long-lead time resources and time sensitive permitting processes for interconnection. The state would benefit from strategies that engage closely with community-based organizations to incorporate their needs into the planning phase.

- Scaling of Demand-side Clean Energy Resources: With the growth of smart-technologies and customer-level energy generation technologies, Californians have a new form of energy efficiency at their disposal – the ability to reduce energy demand by generating their own electricity or shifting their energy demand to times of the day when there is less strain on the electrical grid. The state needs expanded and diversified customer-side clean energy resources, including strategies that scale demand flexibility and that take the greatest advantage of distributed energy resources (DER). One DER that has growing potential in the state is vehicle-grid integration. As electric vehicle and fuel cell purchases increase, these vehicles offer an untapped resource for providing value to the grid during the net peak and support resilience.

- Scaling of Supply-side Clean Energy Resources: Initiatives are needed to support diversification of commercially available technologies that can be deployed in larger sizes (e.g., large customer or utility scale) but need resources to make them more cost-effective. This could include cost share or incentive strategies to address otherwise challenging price premiums.
- Support in Extreme Events: While the Strategic Reliability Reserve (SRR) is making headway to build resources that the state can take advantage of during extreme events, it may require more resources in the SRR to support grid reliability during coincident events such as a heat wave and wildfire-caused transmission outage.

Governor's Proposed Budget for 2023/2024

The Governor's proposed budget identified priorities for the first year of CERIP funding. The priorities focus on addressing planning and extreme events with the anticipated level of funding in 2023/2024 to be $100 million (Table 1). These investments will address issues that provide immediate value to the state, whether through developing strategies to overcome reliability planning challenges or to provide support during near-term extreme events. A key focus for the first year is to take immediate action on the longer lead time activities that will better position the state for future years. Scaling up demand-side and supply-side resources, the remaining priorities can be better addressed with the larger funding pools anticipated in 2024/2025 ($400M) and 2025/2026 ($500M), as laid out in SB 846.

Table 1: Proposed Initiatives and Funding for 2023/2024

Initiative	Proposed Funding
Planning and Enabling Structures to Support Clean Energy Deployment	
• Transmission Planning	$2M
• Assistance for Community Based Organizations Working with State	$8M
• Standup Central Procurement	$32M
• Resources for State & Local Agencies Involved in Development Process	$15M
Augmenting for Extreme Events	
• Augment Resources in Extreme Events (e.g., DSGS, Ag/Water Agencies)	$33M
Administration[1]	$10M
Total	**$100M**

Source: CEC

1 Administration amounts may be redirected to other funding priorities based on department needs.

The CEC proposes expanding the type of initiatives that would be funded in the second and third year. Table 2 provides more detail on these proposed initiatives and funding levels.

Table 2: Funding Priorities by CERIP Program Year

Funding Priority	Proposed Funding 23/24	Proposed Funding 24/25	Proposed Funding 25/26	Proposed Funding Total
Planning and Enabling Structures to Support Clean Energy Deployment	$57	$5	$5	$67
Scaling Demand-side Resources	$0	$175	$270	$445
Scaling Supply-side Resources	$0	$150	$150	$300
Augmenting for Extreme Events	$33	$50	$50	$133
Administration[2]	$10	$20	$25	$55M
Total	$100	$400	$500	$1,000M

Source: CEC

2 Administration amounts may be redirected to other funding priorities based on department needs.

CHAPTER 1: Introduction

Energy reliability in California and nationally is increasingly impacted by highly variable and extreme weather events driven by climate change. California's energy system runs reliably without issue most of the time, and the state has backup assets in place to provide energy during extreme events and avoid outages. The state's greatest energy reliability concerns are driven by a small number of hours during increasingly historic heat events when demand for electricity skyrockets to unprecedented levels and available supply is constrained. If these moments of extreme weather events coincide with other climate-driven extreme events — like drought or fire — the state's energy system could be strained beyond reliability contingencies historically planned for.

Because of these conditions, the California electrical grid has experienced great strain in recent years. In 2020, a west-wide heat event resulted in rotating outages August 14 and 15, because of system-wide electricity shortages of about 500 megawatts (MW). In 2021, dry conditions resulted in a wildfire in Oregon that impacted transmission lines that California depends on for reliability, resulting in loss of 3,000 MW of imports to the California Independent System Operator (California ISO) territory. In 2022, the state experienced record high temperatures between August 31 and September 9. On September 6, 2022, the California ISO recorded a new record peak load at 52,061 MW,[3] nearly 2,000 MW higher than the previous record, despite significant efforts to reduce load during this peak period.

Since 2020 California energy entities have taken steps to address the potential imbalances between the electrical supply and demand in California, in particular as the electric grid transforms to rely on a high penetration of renewables and low-carbon resources. The California Energy Commission (CEC), California Public Utilities Commission (CPUC), California ISO, and Governor's Office (GO) substantially increased coordination and developed the Tracking Energy Development (TED) Task Force with the Governor's Office of Business and Economic Development (GO-Biz) to track new clean energy projects under development in order to help overcome barriers to their completion. The CEC revised the demand forecast to better account for climate change.

Between November 2019 and June 2021, the CPUC mandated an unprecedented amount of procurement, which will bring 14,800 MW of new resources online by 2026. In response to Assembly Bill (AB) 205 (Committee on Budget, Chapter 61, Statutes of 2022), the CEC and Department of Water Resources (DWR) have begun building out the Strategic Reliability Reserve (SRR). The SRR, though in development during that summer, was able to provide support during the extreme heat event the state experienced between August 31 and September 9, including securing imports, additional backup generation, and load reduction

3 "California ISO Peak Load History 1998 Through 2022," accessed on December 8, 2022, https://www.caiso.com/documents/californiaisopeakloadhistory.pdf

that helped avert outages on September 6, when the California ISO recorded the highest demand ever in its territory.

Even with these significant resource additions and strategic reserve resources, there exists uncertainty in the supply-and-demand balance in the next five years, because of weather variability and clean energy project development delays. Thus, the energy agencies must maintain vigilance when assessing the state’s resource needs for the future.

In recognition of these challenges, Senate Bill 846 (Dodd, Chapter 239, Statutes of 2022) (SB 846) put in place actions necessary to support California’s clean energy transition and grid reliability. One of the requirements in the bill directs the CEC, in consultation with the CPUC and the California Air Resources Board (CARB), to develop a Clean Energy Reliability Investment Plan (CERIP). The Plan is intended to support acceleration of the deployment of clean energy resources, support demand response, and increase reliability. The Plan takes into account anticipated demand and supply needs for near- and mid-term reliability, advances SB100 goals, and reduces greenhouse gas emissions in line with state reduction targets. The Plan also supports the loading order, including investments in preferred resources, such as demand response and energy efficiency, and reducing net-peak demand.

In addition to supporting the state's clean energy goals and reliability, proposed CERIP investment in demand-side resources, which is the largest single funding pool, will leverage general fund dollars to help emerging demand side programs with the potential for providing demand reductions at scale in future years. Diversifying demand-side resources helps to bring more types of technologies and approaches to customers and initial investments from the state, which expand scale, also help bring down the cost of these technologies for customers. The CEC is proposing that these demand-side initiatives be informed by engagement with community-based organizations to ensure that they are meeting community needs, including affordability, but also resilience. Funding of supply-side initiatives also supports affordability. These investments can help achieve economies of scale and coordinated procurement, which can be more efficient, particularly through a central procurement function. Some technologies have a minimum capacity threshold to be economic and that may require higher upfront costs that any one load serving entity can support.

CHAPTER 2: California's Reliability Challenges

The CEC has been examining the state's reliability situation in detail since the outages in 2020. The CEC routinely conducts independent analysis of reliability, with a focus on the California ISO territory. The CEC coordinated with the CPUC and California ISO in the analysis of the 2020 outages to develop the Root Cause Analysis.[4] The CEC has held multiple public workshops on reliability in 2021 and 2022 covering a wide variety of issues and soliciting input from balancing authorities, utilities, project developers, non-governmental entities, and communities.

The CEC developed an extensive overview of reliability for the 2021 Integrated Energy Policy Report (IEPR) and an update for the 2022 IEPR, covering topics such as the impacts of drought, wildfire, and extreme heat events; resource adequacy; imports; and new project development. The CEC has worked with the CPUC, California ISO, and GO-Biz on the Tracking Energy Development Task Force in 2021 and 2022, engaging with developers, utilities, and permitting authorities to understand project delays and working collaboratively with relevant partners to overcome delays on projects critical for summer reliability. Through this extensive analysis and outreach, the CEC has identified three critical challenges that are affecting the state's reliability situation: planning, resource scaling, and extreme events.

Planning

Proper planning is the essential first step in guiding electric system reliability. The CEC, California ISO and CPUC have complementary responsibilities. Collectively, the energy entities have identified four areas requiring improved planning processes:

- Improved Modeling: Key to the CEC, California ISO, and CPUC roles, each has models to assess near-term (summer ahead) and mid-term (2 - 10 years) reliability, and the CEC is developing the capability to analyze reliability in the long-term as part of SB 100 analysis. Existing approaches to reliability modeling are not currently well-equipped to account for climate change. The models use historical conditions of weather as the basis for looking forward; however, as we have seen over the last few years, our current weather patterns are not consistent with those of 30 years ago, which is the typical period over which the models are based. All three entities are taking actions to further improve demand forecast and reliability models to better assess different scenarios of weather variability, and prior funding from the Legislature is, in part, supporting the current improvements in the models. However, modeling climate

4 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.

variability is complex and warrants continued efforts to improve the models. Two recently awarded Electric Program Investment Charge research and development projects will support the evolution of analytical approaches to improve the state's ability to account for climate change in planning.

- Improved Resource Adequacy Planning: There are also timing challenges in the current planning approach. Demand forecasts developed annually by the CEC are used by the CPUC to establish resource adequacy procurement (RA) requirements for the load serving entities (LSE). Because of the time required to establish RA requirements and for LSEs to procure, the demand forecast that contracting is based on is usually several years old by the time the year planned for is reached. For example, the CEC adopted the 2021 – 2030 demand forecast in early 2021. The CPUC used this forecast to establish RA requirements for 2022 -2024, initiating the LSEs' procurement process. During 2021, the CEC updated the demand forecast and published a new forecast in early 2022. Changes in economic and other conditions over the course of 2021 resulted in a higher projected demand for 2022 than was predicted in 2021. That difference does not get built into the RA needs for the year and can result in supply needs being greater than contracted supply for the year. The CPUC is working to more frequently review RA procurement.
- Transmission Planning: New resources often require more transmission capacity, and transmission has a longer lead time than project development. The California ISO and utilities have expanded their planning, but more can be done to provide sufficient transmission, particularly by studying potential transmission corridors.
- Enhanced Community Engagement: Lastly, the state continues to work towards better incorporating equity in the clean energy transition. Equity communities have historically carried an outsized burden associated with the grid. Air emissions from fossil plants directly affect their air quality and health. Customers in these communities often lack the resources necessary to shift to clean generation, such as residential or community scale solar and storage, that could provide financial relief on utility bills, better air quality, and resilience in extreme events. State agencies have been working hard to solicit input from community-based organizations to inform the planning process. In the 2022 IEPR, the CEC focused on the challenges affecting communities from the clean energy transition. Workshops organized as part of the 2022 IEPR identified several challenges that equity communities are facing. First, the needs of communities vary, so a one-size-fits-all solution will not support an equitable transition. Second, while community-based organizations in equity communities want to be supportive in identifying solutions, the many hours of time that community leaders spend to educate and inform the state are unfunded and a drain on their limited resources. This approach is not sustainable. The state's planning could benefit greatly from community-based organization input in order to better inform the planning process for community needs, and they are better able to engage if there is reimbursement for their time to engage with state staff to plan out solutions for an equitable future.

Clean Resource Scale

Although the state is experiencing a boom in new project development, there remain challenges to achieving the scale and diversity of resources necessary to accomplish the transition and maintain reliability. This is a challenge for both demand-side and supply-side resources:

- Demand Side Resources: While there has been growth in the deployment of demand side resources, including all types of distributed energy resources, the expansion has not been rapid enough to meet state goals. For example, demand response has declined rather than grown relative to demand increases. Demand-side resources provide direct benefit to customers, while also supporting clean energy goals, and would reduce the need for additional transmission. New strategies are needed to increase demand flexibility of existing resources and to enable pathways for the integration of many more. The state needs more market opportunities that advance demand reduction, including pathways that expand aggregation of many resources into virtual power plants. Moreover, the state needs to diversify distributed generation technologies to hedge against supply chain issues with solar and storage. Appropriately integrated to a building, newer technologies also can provide resilience as part of a microgrid that can provide community resilience. Electric vehicles are growing in popularity in all applications (light, medium, and heavy duty) and have yet to be tapped for bi-directional charging at any meaningful scale, either to provide customer and grid support in vehicle-grid integration (VGI) or vehicle to building (V2B) applications. VGI and V2B could take advantage of electricity surpluses during peak solar times and reduce load during the net peak by drawing on the vehicle's battery. Resounding feedback in the CEC's public workshops is for much greater deployment of demand side resources. The state needs additional strategies to expand deployment of these resources, especially in equity communities that lag other communities in the deployment of these resources.
- Supply-Side Resources: The state needs a more diverse portfolio of utility-scale resources. There are several challenges facing supply-side resources. As noted previously, interconnection and permitting delays are impacting new resources from coming online. Finding solutions to speed up interconnection and permitting will be critical to enable the backlog of new projects to come online quickly. The state also needs to diversify the types of supply-side resources. Currently, there is a predominate focus on solar and storage, and industry has experienced the challenges of supply chain disruptions for these solar and storage projects. Alternative commercial technologies exist (e.g., fuel cells, non-lithium-ion energy storage) as well as long-lead time resources (e.g., offshore wind, geothermal, pumped hydro) that do not face the same supply chain problems. Deployment of these resources are challenged by cost and longer planning horizons. Strategies are needed to support these more diverse resources. For smaller supply-side resources that often have a price premium, incentive or cost share programs could support their deployment in the near term. Larger, long-lead time resources will need more planning and financing strategies. The state needs

one or more entities that can take on the higher burden associated with planning for these long-lead resources.

Augmenting for Extreme Events

Climate change-driven extreme events will continue to pose challenges to grid reliability. The CEC and California ISO analysis in 2022 found that the state could experience shortfalls of 7,000 – 10,000 MW during coincident events, such as heat wave, drought, and wildfire.[5] The state has developed the Strategic Reliability Reserve (SRR) to provide resources during an extreme event. The SRR is anticipated to provide up to 5,000 MW when the three programs are fully operational. One program in the SRR – the Demand Side Grid Support (DSGS) – was able to sign up more than 300 MW in the first summer (2022). The CEC's Distributed Electricity Backup Assets (DEBA) program is under development. A challenge grant will be issued in Spring 2023, followed by additional funding opportunities. At these levels, the SRR would not provide the level of backup resources that the state could require in coincident events. Therefore, the plan should consider additional backup generation for extreme events.

5 TN#243171, "May 20, 2022, Presentation – May 2.0 Reliability Workshop Overview," https://efiling.energy.ca.gov/GetDocument.aspx?tn=243171.

CHAPTER 3: Clean Energy Resource Priorities

The state has taken a substantial number of steps to support the state's clean energy goals and support grid reliability, including developing newly funded programs to expand deployment of clean energy resources, ordering procurement of additional resources to support reliability, and improving planning processes. The CEC also anticipates that the state will benefit from additional federal resources that will support clean energy development and reliability; however, this report does not consider those funding resources directly because most have not been awarded. However, the CEC will seek to maximize opportunities for situations where CERIP could provide critical match funding to bring additional federal resources to support activities that overlap with the goals of CERIP.

Based on the issues facing the state as mentioned in the previous chapter and the ability of existing programs to overcome these challenges, the CEC identified the following key priorities for additional funding that CERIP can support planning and enabling structures to support clean energy deployment, scaling demand-side clean energy resources, scaling supply-side clean energy resources, and augmenting resources for extreme events.

Planning and Enabling Structures to Support Clean Energy Deployment

There are certain activities that do not directly reduce demand or generate electricity directly but are critical to set a path more effectively to achieving greater load reduction and generation. These activities include improving planning processes and supporting the development of new or improving existing institutional structures that enable resources to support grid reliability. The CEC has identified four focus areas for CERIP funding for enabling investments. Two of these will improve planning processes and two will support institutional structures development/improvement:

- Transmission Planning: The state would benefit from investing in additional planning for transmission. The typically long development cycle associated with transmission development makes this a prime area to focus on in the near term. Studies that evaluate different potential transmission corridors can advance the planning process. Relatively small investments in this space could be critical to inform transmission development.
- Community Engagement: As noted previously, the state has shifted to a greater focus on supporting equity communities. The state would benefit from greater support from community-based organizations. Resources to reimburse community-based organizations for their involvement in state planning activities will help to provide additional, valuable community feedback to improve planning, identify project types that could benefit communities, and help inform permitting and development of clean energy resources.

- Stand up Department of Water Resources (DWR) Central Procurement Function (CPF): Resources in this area would fund the staffing to build the CPF within DWR. This funding would not be used to fund procurement of energy resources. DWRs CPF will enable the state to procure and catalyze the development of long-lead time, large, and diverse clean resources (e.g., geothermal, offshore wind, long duration energy storage, etc.). These energy resources require years of planning and strategic financing mechanisms to develop. The CPF can further contribute to long-term energy reliability and greenhouse gas reduction goals by facilitating larger purchases and coordinated procurement ahead of time.
- Expediting Permitting: Additional resources would significantly reduce the time needed to review projects for permitting of transmission and distribution assets. Resources may be used in several ways: bringing on expertise now to take on the backlog of reviews, developing strategies to streamline processes (e.g., through guidance or electronic workflow tools), and building institutions that will create a pipeline of qualified expertise to grow the field.

Scaling Demand-side Clean Energy Resources

Funding in this area would support new initiatives (e.g., new market structures and leading-edge clean energy technologies) that can support customer-side applications. The customer side applications could include expanding demand flexibility, through developing new market structures, such as the creation of virtual power plants of aggregated customer resources, or incentives for controls for expanding existing demand response programs. Funding could also be used for incentives to expand the deployment of a more diverse suite of distributed generation and storage technologies, either paired or individually. This could also include development of community scale microgrids that would provide resilience, particularly in equity communities. Funding could be used to support rapid scale up of VGI and V2B, particularly in collaboration with electric vehicle infrastructure buildout funded through separate programs.

Scaling Supply-side Clean Energy Resources

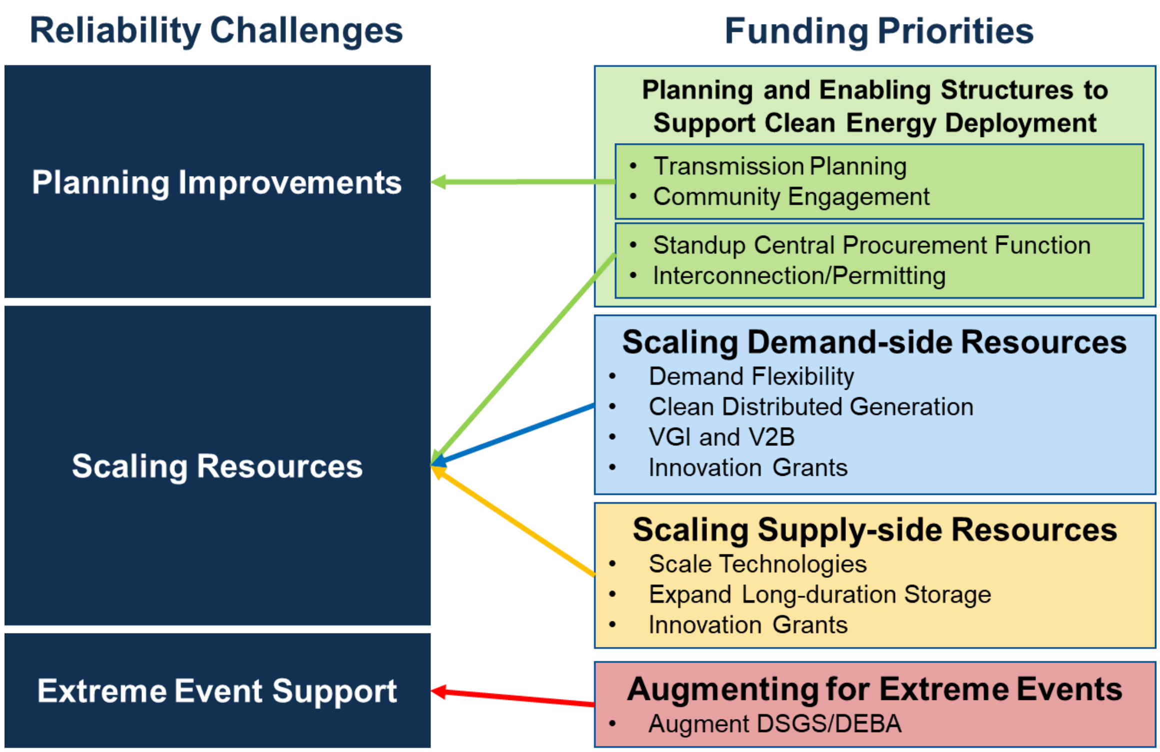
Funding in this area would support commercially available technologies that can be deployed in larger sizes (e.g., large customer or utility scale) but need resources to make them more cost-effective. The intent of this funding is to reduce the cost barrier now, to expand deployment and interest from customers and developers, and to help drive down the cost over the mid-term. This would help drive down deployment costs and make the technologies more commercially viable. Funding in this area could include incentives for deployment or cost share. Levels of support will depend on the technology and applications.

Augmenting for Extreme Events

Funding in this area would be directed to increase electric service reliability in the face of extreme weather events, drought, and fire. Existing programs, such as the SRR, that are designed to support the grid in extreme events may not develop a sufficient level of resources to meet high demand in extreme events, as currently funded. Funding in this area could be used to supplement existing programs (e.g., DSGS and DEBA) and develop new strategies, such as incentive programs that take advantage of untapped load-shifting opportunities like those that water agencies and the agriculture industry could provide. Both can shift pumping loads or support critical pumping with energy storage during the net peak, reducing stress on the grid during emergencies. To enable this, they may require additional equipment such as advanced controls, storage tanks, and energy storage. Funding could be used to support development of new programs that support higher levels of demand flexibility during the net peak.

Figure 1 illustrates the relationship between the funding priorities identified for CERIP and the three reliability challenges identified by CEC.

Figure 1: Alignment Between Reliability Challenges and Funding Priorities



Source: CEC

Chapter 4: Investment Strategy

Approach

SB 846 proposes appropriations in three separate allocations: $100 million in fiscal year 23/24, $400 million in 24/25, and $500 million 25/26. Key legislative actions in 2022 initiated multiple new clean energy programs, which are in the early stages of implementation. Therefore, the first year of CERIP funding is focused on enabling investments critical to supporting broader future investment and taking actions in 2023 to augment resources for the potential of extreme events in the summer of 2024 and beyond. This strategy will ensure that lessons learned from the stand-up of other new programs complements the initiatives for CERIP years two and three, so they can focus on gaps, particularly in scaling demand-side and supply-side solutions.

The Governor's proposed January 2023 budget identified priorities to be considered by the Legislature for the 23/24 CERIP appropriations of $100 million. The proposed budget initiatives in 23/24 are designed to address needs in two of the four investment priorities that CEC identified. The Governor's key priorities: improving planning, scaling resources through improvements to institutional infrastructure, and extreme event support. The initiatives identified will support near-term needs. For example, support to agencies involved in the permitting will help address the current new project backlog. This will help with near-term RA needs. Augmenting resources to prepare for extreme events also supports near-term reliability. The remaining initiatives assist the state on actions that have longer lead times, including planning transmission, supporting community-based organizations to inform the planning process, and supporting the standup of a CPM that can begin to work on long-lead time resources. Each of these can be achieved through the smaller funding pool in the first year. First year funding also establishes administrative funds to bring on CEC staff to develop and manage the initiatives in the first year and prepare initiatives for future funding years. Administrative funding is also necessary for additional technical support to evaluate potential incentive structures and deployment strategies. Future year initiatives, where funding pools will be larger, will focus more on scaling and diversification of resources.

Investments for Fiscal Year 2023/2024

Table 3 provides additional details of the funding priorities for the first year of the program.

Table 3: CERIP First Year Funding Priorities

Initiative	Proposed Funding
Planning and Enabling Structures to Support Clean Energy Deployment	
• Support critical planning studies, such as Transmission Corridor Planning, and implementing recommendations in the permitting roadmap for offshore wind resources.	$2M
• Improve processes and provide resources that support engagement and technical assistance for communities of concern	$8M
• Support DWR to standup a CPM	$32M
• Address barriers throughout the energy resource development process, including permitting and interconnection delays, for local and state agencies, and other appropriate entities	$15M
Augmenting for Extreme Events	
• Augment investments to support near-term electric system reliability, including during extreme weather conditions. This funding allocation will prioritize energy resources that can be deployed and available by June 2024. This may include additional funding for the DSGS Program or DEBA Program that support additional demand reduction opportunities in industries such as agricultural and water sectors.	$33M
Administration[6]	
Funding for administration and implementation costs at the CEC, including funding for increased staffing and technical support	$10M
Total	**$100M**

Source: CEC

6 Administration amounts may be redirected to other funding priorities based on department needs.

Investments for Fiscal Years 2024/2025 and 2025/2026

The CEC proposes that funding in future years will fund initiatives in each of the funding priority categories, but in different proportions. The CEC proposes continued funding for enabling investments, but at a lower level than in the first year, to focus less on planning activities in future years and more on scaling of resources. The CEC proposes continued support to augment resources for extreme events, with a slightly increased but level funding in years two and three to bring on additional sectors that can support grid reliability during extreme events.

The CEC proposes allocating significant funds in years two and three to initiatives that scale the deployment of both demand-side and supply-side solutions, with a greater focus on demand-side resources. Funding for these initiatives is expected to be capital intensive and could include incentives and cost share funding as tools to leverage matching non-state public sector and private sector investment. The CEC will monitor federal opportunities and leverage CERIP funds as cost share, as appropriate, to capitalize on available federal funding.

Demand-side initiatives include ones that expand demand flexibility and distribution level interconnections of clean energy resources, and may include the following:

- Enabling Demand Flexibility: Providing incentives for enabling demand flexibility (controls, equipment, etc.). Provide incentives for demand enabling solutions for end-customers, including large industrial customers, C&I, state agencies, local governments, and tribes that otherwise would not be able to participate in DR programs or during extreme events.
- Distributed Generation and Energy Storage: Diversifying the portfolio of clean generation and energy storage at the distribution level. This includes implementing technologies not commonly used today. Potential clean energy resources identified through stakeholder input include fuel cells, linear generators, non-lithium ion energy storage, and repurposed batteries as stand-alone demand-side support or included in community scale microgrids.
- VGI and V2B: Investing in advanced controls for infrastructure that allow electrified loads such as buildings and vehicles to support the grid. An initiative that strategically deploys capital to empower VGI and V2B could be the most cost-effective investment of this investment portfolio.
- Innovation Grants: Evaluate strategies not previously deployed but that appear to have the potential to unlock greater demand-side value. This initiative would solicit new strategies for deploying clean energy technologies. Innovation grants would be structured to demonstrate a new approach to supporting customers and the grid through demand-side applications. Grants would fund projects that are a combination of new approaches and either newly commercial or commercially ready technologies in applications that can be readily transferrable across the state.

Supply-side initiatives include ones that diversify and support commercial-ready bulk grid and long-lead time energy resources, and may include the following:

- Scaling Supply-side Technologies: Expanding clean energy generation options by helping scale commercially ready technologies. Many newer technologies, including those that have been under development over recent years – and even funded in part by CEC Electric Program Investment Charge program grants – are just now becoming commercially viable. These new classes of technologies will benefit from investments that can move them from demonstrations to large-scale deployments. Other more established technologies, such as geothermal, pumped hydro, or transmission may have new opportunities for deployment, especially when combined with additional investment to push them towards economic feasibility.
- Long-duration Energy Storage: Augment existing program to further expand the diversity of long-duration energy storage technologies, particularly non-lithium ion, that can provide extended reliability support at the net peak.
- Innovation Grants: Evaluate strategies or provide cost share for utility-scale projects. This initiative could fund strategies not previously deployed but that appear to have the potential to unlock greater supply-side value. This initiative would solicit new strategies for deploying clean energy technologies. Innovation grants would be structured to demonstrate a new approach to supporting customers and the grid through demand-side applications. Grants would fund projects that are a combination of new approaches and either newly commercial or commercially ready technologies in applications that can be transferrable across the state.

Table 4 provides the proposed funding for the second and third year of CERIP and includes the first year for comparison. The second and third years focus more on scaling demand- and supply-side resources.

Table 4: CERIP Year Two and Three Funding Priorities

Initiative	2023/24	2024/25	2025/26	Total
Planning and Enabling Structures to Support Clean Energy Deployment	**$57M**	**$5M**	**$5M**	**$67M**
Scaling Demand-side Clean Resources	**$0**	**$175M**	**$270M**	**$445M**
Scaling Supply-side Clean Resources	**$0**	**$150M**	**$150M**	**$300M**
Augmenting for Extreme Events	**$33M**	**$50M**	**$50M**	**$133M**
Administration[7]	**$10M**	**$20M**	**$25M**	**$55M**

7 Administration amounts may be redirected to other funding priorities based on department needs.

Initiative	2023/24	2024/25	2025/26	Total
Total	**$100M**	**$400M**	**$500M**	**$1000M**

Source: CEC

CERIP Implementation

Upon appropriation of funds, the CEC will use existing staff resources to begin implementation, while hiring additional staff into existing CEC program teams to further develop more complex programs, issue grant funding opportunities and contracts, manage the initiatives, and track funding and initiative progress and impact. The CEC will explore the most efficient and effective method for implementing each initiative.

The CEC will hold periodic public workshops to solicit concepts for initiatives, receive input on proposed guidelines for initiatives and their scope and structure, and feedback on program performance. The CEC will coordinate the program with the CPUC, CARB, DWR, and California ISO so that initiatives do not compete with or duplicate other funded initiatives and to identify where CERIP funding can enhance existing programs (e.g., expand an electric vehicle infrastructure development grant to include VGI demonstrations that support the net peak).

APPENDIX A: Acronyms and Abbreviations

AB – Assembly Bill

BA – balancing authority

California ISO – California Independent System Operator

CARB – California Air Resources Board

CEC – California Energy Commission

CERIP – Clean Energy Reliability Investment Plan

CPM – Central Procurement Mechanism

CPUC – California Public Utilities Commission

DEBA – Distributed Electricity Backup Assets

DER – distributed energy resources

DR – demand response

DSGS – Demand Side Grid Support

DWR - Department of Water Resources

GO – Governor's Office

GO-Biz – Governor's Office of Business and Economic Development

IEPR – Integrated Energy Policy Report

IOU – investor-owned utility

LSE – load-serving entity

MW – megawatt

POU – publicly owned utility

RA – resource adequacy

SB – Senate bill

SRR – Strategic Reliability Reserve

TED – Tracking Energy Development

APPENDIX B: Glossary

For additional information on commonly used energy terminology, see the following industry glossary links:

- California Air Resources Board Glossary, available at https://ww2.arb.ca.gov/about/glossary
- California Energy Commission Energy Glossary, available at https://www.energy.ca.gov/resources/energy-glossary
- California Energy Commission Renewables Portfolio Standard Eligibility Guidebook, Ninth Edition Revised, available at: https://efiling.energy.ca.gov/getdocument.aspx?tn=217317
- California Independent System Operator Glossary of Terms and Acronyms, available at: http://www.caiso.com/Pages/glossary.aspx
- California Public Utilities Commission Glossary of Acronyms and Other Frequently Used Terms, available at https://www.cpuc.ca.gov/glossary/
- Federal Energy Regulatory Commission Glossary, available at https://www.ferc.gov/about/what-ferc/about/glossary
- North American Electric Reliability Corporation Glossary of Terms Used in NERC Reliability Standards, available at: https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf
- US Energy Information Administration Glossary, available at: https://www.eia.gov/tools/glossary/

Balancing authority

A balancing authority is the responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a balancing authority area, and supports interconnection frequency in real time. Balancing authorities in California include the Balancing Authority of Northern California (BANC), California ISO, Imperial Irrigation District (IID), Turlock Irrigation District (TID), and Los Angeles Department of Water and Power (LADWP). The California ISO is the largest of about 38 balancing authorities in the Western Interconnection, handling an estimated 35 percent of the electric load in the West. For more information, see the WECC Overview of System Operations: Balancing Authority and Regulation Overview, available at https://www.wecc.org/Administrative/06-Balancing%20Authority%20Overview.pdf.

Climate change

Climate change refers to a change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. **Anthropogenic** climate change is defined by the human impact on Earth's climate while **natural** climate change are the natural climate cycles that have been and continue to occur throughout Earth's history. Anthropogenic (human-induced) climate change is directly linked to the amount of fossil fuels burned, aerosol releases, and land alteration from agriculture and deforestation. For more information, see the Energy Education Natural vs Anthropogenic Climate Change Web page, available at https://energyeducation.ca/encyclopedia/Natural_vs_anthropogenic_climate_change.

Demand response (DR)

Demand response refers to providing wholesale and retail electricity customers with the ability to choose to respond to time-based prices and other incentives by reducing or shifting electricity use ("shift DR"), particularly during peak demand periods, so that changes in customer demand become a viable option for addressing pricing, system operations and reliability, infrastructure planning, operation and deferral, and other issues. It has been used traditionally to shed load in extreme events ("shed DR"). It also has the potential to be used as a low-greenhouse gas, low-cost, price-responsive option to help integrate renewable energy and provide grid-stabilizing services, especially when multiple distributed energy resources are used in combination and opportunities to earn income make the investment worthwhile.

For more information, see the CPUC Demand Response Web page, available at: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr

Distributed energy resources (DER)

Distributed energy resources are any resource with a first point of interconnection of a utility distribution company or metered subsystem. Distributed energy resources include:

- Demand response, which has the potential to be used as a low-greenhouse gas, low-cost, price-responsive option to help integrate renewable energy and provide grid-stabilizing services, especially when multiple distributed energy resources are used in combination and opportunities to earn income make the investment worthwhile.
- Distributed renewable energy generation, primarily rooftop photovoltaic energy systems.
- Vehicle-Grid Integration, or all the ways plug-in electric vehicles can provide services to the grid, including coordinating the timing of vehicle charging with grid conditions.
- Energy storage in the electric power sector to capture electricity or heat for use later to help manage fluctuations in supply and demand.

Equity communities

The state has many terms and definitions that refer to similar or overlapping equity communities such as disadvantaged, low-income, and underserved, communities. These communities are often in areas affected by poor air quality from burning fossil fuels and are less likely to have access to clean energy resources.

Extreme weather event

An extreme weather event is an event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season).

Integrated Energy Policy Report (IEPR)

Senate Bill 1389 (Bowen, Chapter 568, Statutes of 2002) requires the California Energy Commission to prepare a biennial integrated energy report. The report, which is crafted in collaboration with a range of stakeholders, contains an integrated assessment of major energy trends and issues facing California's electricity, natural gas, and transportation fuel sectors. The report 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. For more information, see the CEC Integrated Energy Policy Report Web page, available at https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report.

Integrated Resource Planning (IRP)

The CPUC's Integrated Resource Planning (IRP) process is an "umbrella" planning proceeding to consider all of its electric procurement policies and programs and ensure California has a safe, reliable, and cost-effective electricity supply. The proceeding is also the Commission's primary venue for implementation of the Senate Bill 350 requirements related to IRP (Public Utilities Code Sections 454.51 and 454.52). The process ensures that load serving entities meet targets that allow the electricity sector to contribute to California's economy-wide greenhouse gas emissions reductions goals. For more information see the CPUC Integrated Resource Plan and Long-Term Procurement Plan (IRP-LTPP) Web page, available at https://www.cpuc.ca.gov/irp/.

Investor-owned utility (IOU)

Investor-owned utilities (IOUs) provide transmission and distribution services to all electric customers in their service territory. The utilities also provide generation service for "bundled" customers, while "unbundled" customers receive electric generation service from an alternate provider, such as a Community Choice Aggregator (CCA). California has three large IOUs offering electricity service: Pacific Gas and Electric, Southern California Edison, and San Diego Gas & Electric.

Load serving entity (LSE)

A load serving entity is defined by the California Independent System Operator as an entity that has been "granted authority by state or local law, regulation or franchise to serve [their] own load directly through wholesale energy purchases." For more information see the California Independent System Operator's Web page, available at https://www.caiso.com/Pages/default.aspx

Once-through cooling (OTC)

Once-through cooling technologies intake ocean water to cool the steam that is used to spin turbines for electricity generation. The technologies allow the steam to be reused, and the ocean water that was used for cooling becomes warmer and is then discharged back into the ocean. The intake and discharge have negative impacts on marine and estuarine environments. For more information on the phase-out of power plants in California using once-through cooling, see the Statewide Advisory Committee on Cooling Water Intake Structures Web page, available at https://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/saccwis/, and the CEC Once-Through Cooling Phaseout Tracking Progress Report, available at https://www.energy.ca.gov/sites/default/files/2019-12/once_through_cooling_ada.pdf.

Planning reserve margin (PRM)

Planning reserve margin (PRM) is used in resource planning to estimate the generation capacity needed to maintain reliability given uncertainty in demand and unexpected capacity outages. A typical PRM is 15 percent above the forecasted 1-in-2 weather year peak load, although it can vary by planning area. The CPUC's resource adequacy program is increasing the PRM requirement to 16 percent minimum for 2023, and 17 percent minimum for 2024 and beyond.

Publicly owned utility (POU)

Publicly owned utilities (POUs), or Municipal Utilities, are controlled by a citizen-elected governing board and utilizes public financing. These municipal utilities own generation, transmission and distribution assets. In contrast to CCAs, all utility functions are handled by these utilities. Examples include the Los Angeles Department of Water and Power and the Sacramento Municipal Utility District. Municipal utilities serve about 27 percent of California's total electricity demand.

Renewables Portfolio Standard (RPS)

The *Renewables Portfolio Standard*, also referred to as *RPS*, is a program that sets continuously escalating renewable energy procurement requirements for California's load-serving entities. The generation must be procured from RPS-certified facilities (which include solar, wind, geothermal, biomass, biomethane derived from landfill and/or digester, small hydroelectric, and fuel cells using renewable fuel and/or qualifying hydrogen gas). More information can be found at the , available at https://www.energy.ca.gov/programs-and-topics/programs/renewables-portfolio-standard, and the CPUC RPS Web page, available at https://www.cpuc.ca.gov/rps/.

Resource adequacy (RA)

The program that ensures that adequate physical generating capacity dedicated to serving all load requirements is available to meet peak demand and planning and operating reserves, at or deliverable to locations and at times as may be necessary to ensure local area reliability and system reliability. For more information, see the CPUC Resource Adequacy Web page, available at https://www.cpuc.ca.gov/ra/.

Scenario

A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (for example, rate of technological change, prices) and relationships. Note that scenarios are neither predictions nor forecasts, but are used to provide a view of the implications of developments and actions.

Time-dependent electricity rates

Also known as time-of-use rates, time-dependent electricity rates vary depending on the time periods in which the energy is consumed. In a time-of-use rate structure, higher prices are charged during utility peak-load times. Such rates can provide an incentive for consumers to curb power use during peak times.

Transmission Planning Process (TPP)

The California Independent System Operator's annual transmission plan, which serves as the formal roadmap for infrastructure requirements. This process includes stakeholder and public input and uses the best analysis possible (including the Energy Commission's annual demand forecast) to assess short- and long-term transmission infrastructure needs. For more information, see the California ISO Transmission Planning Web page, available at http://www.caiso.com/planning/Pages/TransmissionPlanning/Default.aspx.