

California Energy Commission

STAFF PAPER

Electric System Reliability and the Recent Role of California's Fossil Fleet

Actions Taken for Incremental Resources to Prepare for Summer 2021

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ABSTRACT

The *Electric System Reliability and the Recent Role of California's Fossil Fleet: Actions Taken for Incremental Resources to Prepare for Summer 2021* report summarizes the California Energy Commission's Siting, Transmission, and Environmental Protection Division's actions taken to address weather-related threats to the state's electricity supply and support summer 2021 system reliability. The actions were initiated by Governor Gavin Newsom's August 17, 2020, letter requiring the California Independent System Operator, the California Public Utilities Commission, and the California Energy Commission to determine the root cause of the August 14 and 15 rotating electricity outages, make recommendations, and implement those recommendations to address outages for summer 2021 and beyond. The final root cause analysis confirmed there was no single root cause of the August 2020 outages but rather found the three causal factors that contributed to the outages were extreme weather conditions, resource adequacy and planning processes, and market practices.

Keywords: Application, base load, battery, combined cycle plant, fossil fuel, megawatt, peak load, power plant, reliability

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EXECUTIVE SUMMARY

In 2020, two extreme heat events, or heat waves, impacted the western United States. During the first heat wave on August 14 and 15, 2020, the California Independent System Operator (California ISO) was forced to institute rotating electricity outages in California. After this, state agencies implemented emergency measures that avoided further electric system outages in the California ISO system as experienced during the second heat wave beginning on September 3, 2020. , Governor Gavin Newsom then directed the California Energy Commission (CEC), the California Public Utilities Commission (CPUC), and the California ISO, to report on the root causes of the events leading to the outages. The three agencies were further directed to take actions to identify potential additional generation supplies that could be available in summer 2021 to help avoid future rotating electricity outages.

The Final Root Cause Analysis report (final analysis) was published on January 13, 2021. The final analysis identified three major causal factors that contributed to the summer 2020 outages: (1) extreme weather conditions, (2) inadequate resource adequacy and planning processes, and (3) market practices.

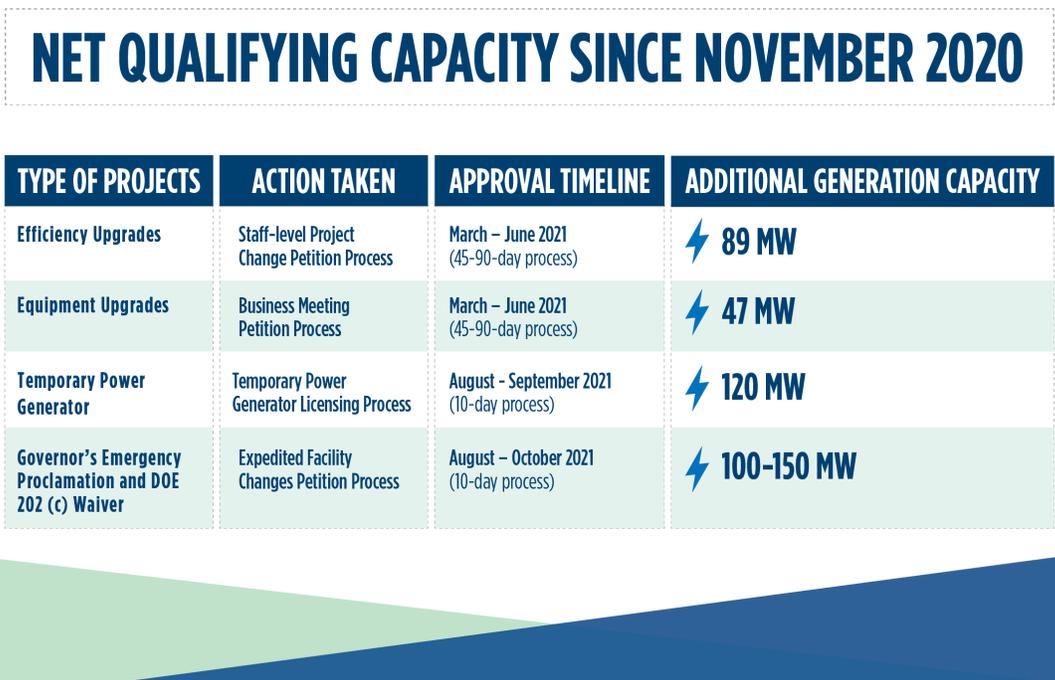
As a result of the Governor's directive and the subsequent release of the final analysis, the CEC's Siting, Transmission and Environmental Protection Division took several actions to address the performance of resources credited to resource adequacy requirements by the CEC-jurisdictional power plant fleet, identify potential additional generation in preparation for 2021 summer heat waves, and avoid rotating electricity outages. These actions include the following:

1. Hosted a December 2020 Lead Commission workshop titled "[Incremental Efficiency Improvements to the Natural Gas Powerplant Fleet for Electric System Reliability and Resiliency](#)" (Docket 20-SIT-01) that included stakeholder presentations and discussion on a range of options for incremental upgrades at existing geothermal, solar thermal, and natural gas-fired facilities to increase capacities.
2. Reviewed and approved efficiency and post certification project change petition improvements between March and June 2021 to increase capacity totaling an additional 136 megawatts (MW). These petitions were filed by project owners and operators in response to the CPUC's Rulemaking Order 20-11-003, which directed California's three large electric investor-owned utilities to seek contracts for additional power.
3. Requested all 76 CEC-jurisdictional power plant owners and operators to report to the CEC any unplanned incident that limits generating capacity, or the operations are impaired and cannot meet their commitment to the California ISO. Throughout summer 2021, jurisdictional facilities that experienced operational impairments or shutdowns immediately emailed CEC staff.
4. Conducted a July 2021 survey of the CEC-jurisdictional fleet to identify types of projects that could be expedited, including efficiency upgrades, battery energy storage system expansions, and opportunities to locate temporary power generator units at existing natural gas-fired facilities.

5. Identified reasons for power plant owners withdrawing project change petitions that could have provided additional generation potential in support of the grid during summer 2021 heat waves.
6. Participated in an August 30, 2021, workshop to summarize the reliability issues and provide an update on steps taken to address these issues.
7. Developed procedures to expedite post certification petitions at existing facilities, license temporary power generators of 10 MW or more, and license battery storage systems of 20 MW or more that can discharge for at least two hours in response to the Governor’s July 30, 2021 Emergency Proclamation.

As shown in Figure ES-1, CEC staff was able to work with power plant owners and operators to identify and implement near-term physical improvements to add between 236 and 286 MWs of net qualifying capacity at existing jurisdictional facilities, and another 120 MW in proposed temporary power generators to support summer reliability in 2021 and beyond. The CEC staff also provided consultation with California ISO and the California Air Resources Board (CARB) to inform the Department of Energy (DOE) which facilities would require a Title V waiver under their Emergency Order pursuant to section 202(c) of the Federal Power Act.

Figure ES-1: Net Qualifying Capacity Resulting from CEC Actions Since November 2020



CHAPTER 1:

2020 Extreme Events and Electricity Reliability Concerns

Recent Heat Events and System Reliability Problems in California

A significant portion of California’s in-state electricity generation comes from combustion turbine-based capacity, or otherwise known as thermal capacity. Thermal capacity is operated at less than its rated maximum capability or derated, during hot, dry conditions associated with extreme heat waves. The multistate drought conditions have also reduced hydropower availability throughout the West. Together, the drought and extreme heat conditions increase the threat and severity of wildfires in California and the western United States. Wildfires can also impact system reliability — smoke from fires decreases solar output, and energy imports are reduced when transmission lines are threatened, derated, or even shutdown because of wildfire.

During August and September 2020, California and the western United States experienced unprecedented heat waves and storms. At the same time, several wildfires raged across California and the western United States, and electricity demand exceeded supply. The heat and wildfires significantly impacted electrical energy generation and transmission. The extensive heat stressed several natural gas power plant subsystems, resulting in power loss in combustion turbines, inlet air and cooling system stresses, steam tube leaks, and condenser pump failures. Smoke from wildfires also decreased solar facility output.

On August 14, 2020, California ISO issued a Stage 3 emergency notice¹ because of a lack of sufficient operating reserves due to several factors. The lack of operating reserves triggered rotating outages to maintain grid stability and avoid a more widespread electrical grid shutdown. As a result, investor-owned utilities (Pacific Gas and Electric Company [PG&E], Southern California Edison [SCE], and San Diego Gas & Electric Company [SDG&E]) in the California ISO-controlled grid experienced their first rotating outages in 20 years. On August 15, 2020, California ISO issued another Stage 3 emergency notice. Ambient temperatures were 10 to 25 degrees Fahrenheit above normal. This situation was described as a “1-in-35-year event,” which far exceeded the 1-in-10-year planning horizon used for power plant system reliability studies.

As a direct result of these two events, on August 16, 2020, Governor Newsom issued an emergency proclamation² to free up additional capacity and allow use of backup energy sources. This proclamation led to energy conservation measures and support from power plant

1 [California ISO Stage 3 Emergency Notice, August 14, 2020.](http://www.caiso.com/Documents/Stage-3-Emergency-Declared-Rotating-Power-Outages-Initiated-Maintain-Grid-Stability.pdf)

[http://www.caiso.com/Documents/Stage-3-Emergency-Declared-Rotating-Power-Outages-Initiated-Maintain-Grid-Stability.pdf.](http://www.caiso.com/Documents/Stage-3-Emergency-Declared-Rotating-Power-Outages-Initiated-Maintain-Grid-Stability.pdf)

2 [August 16, 2020, Proclamation of a State of Emergency](https://www.gov.ca.gov/wp-content/uploads/2020/08/8.16.20-Extreme-Heat-Event-proclamation.pdf)

[https://www.gov.ca.gov/wp-content/uploads/2020/08/8.16.20-Extreme-Heat-Event-proclamation.pdf.](https://www.gov.ca.gov/wp-content/uploads/2020/08/8.16.20-Extreme-Heat-Event-proclamation.pdf)

operators and balancing authorities other than California ISO, which helped avoid additional outages on the following days.

On August 17, 2020, because of the intensifying heat wave, Governor Newsom issued Executive Order N-74-20³ and ordered the suspension of permitting requirements or conditions adopted by CEC and local air quality management districts that restricted the amount of power a facility may generate or the amount of power a facility may use, or impose air quality requirements that prevent the facility from generating additional power during peak demand hours. The order required any facility that operated under this emergency order to report to the CEC, the California Air Resources Board (CARB), and the local air district.

On September 3, 2020, Governor Newsom extended the emergency proclamation through midnight September 8. In addition, the California ISO issued a statewide Flex Alert beginning September 5 through September 7 for voluntary load reductions each day from 3 p.m. to 9 p.m. warning that consumers should “be prepared for potential power outages, both planned and unplanned during extreme heat events.”⁴

On September 5, 2020, California ISO directed all generating facilities in its balancing authority area to produce the maximum capability during certain times of the day, because the electric grid lost nearly 1,600 MW of generation as a result of wildfires forcing transmission lines out of service. In response to California ISO’s directive, some generators indicated that they could not produce maximum generation capability without exceeding federal air quality or other permit limitations.

On September 6, 2020, California ISO requested the Secretary of Energy concur and declare that the State of California is in the middle of an electric reliability emergency pursuant to section 202(c) of the Federal Power Act.⁵ In response, DOE issued Order N. 202-20-2 “to preserve the reliability of bulk electric power system.”⁶

3 [August 17, 2020, Executive Order N-74-20](#)

<https://www.gov.ca.gov/wp-content/uploads/2020/08/8.17.20-EO-N-74-20.pdf>.

4 [September 3, 2020 State-wide Flex Alert](#)

<http://www.caiso.com/Documents/FlexAlertIssued-WeekendCalling-EnergyConservation.pdf>.

5 [September 6, 2020 California ISO emergency request to DOE](#)

<http://www.caiso.com/documents/Order-202-20-2-9-6-5p.pdf>.

6 [September 6, 2020 DOE Order 202-20-2](#)

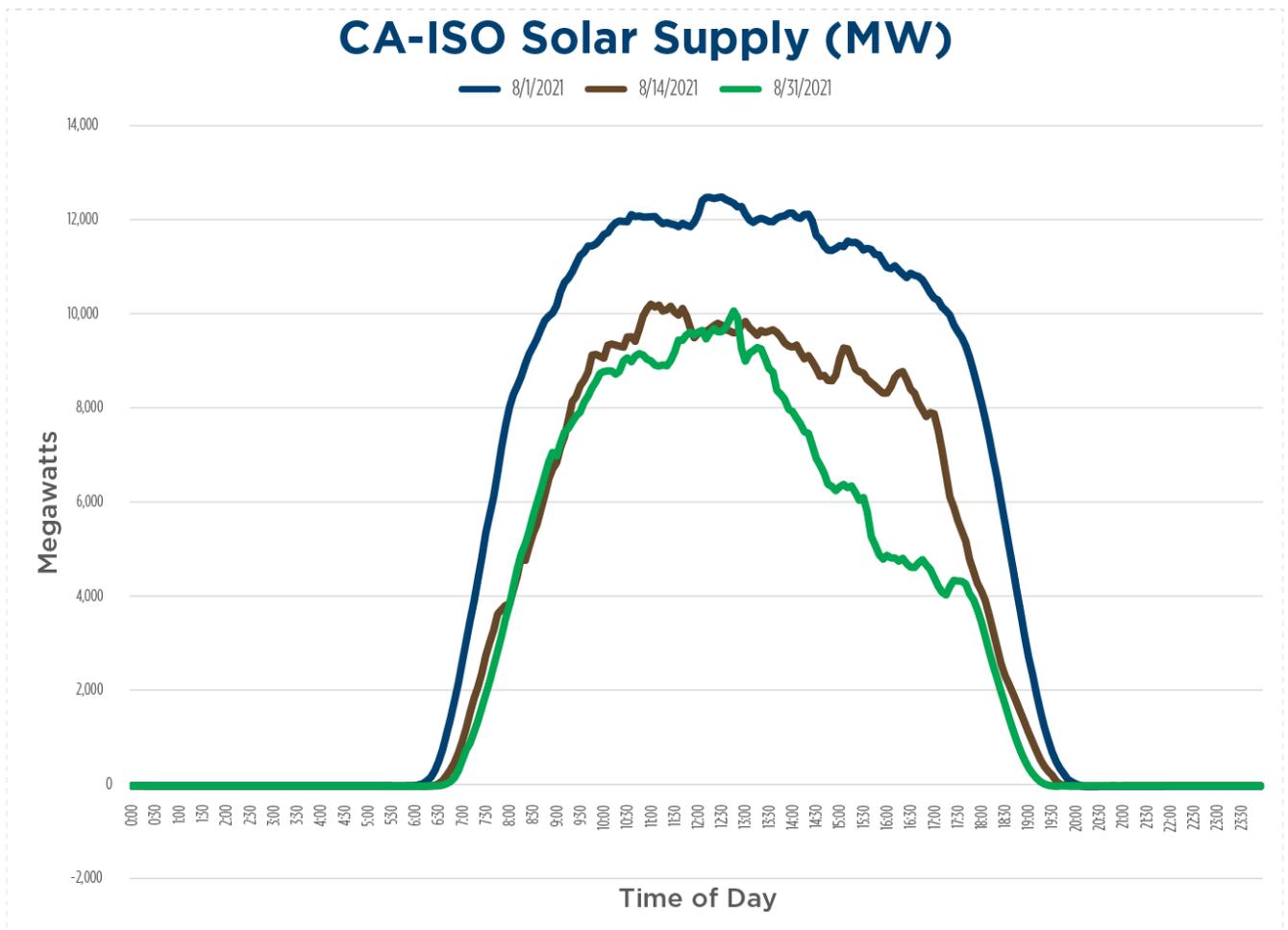
<https://www.energy.gov/sites/prod/files/2020/09/f78/CAISO%20202c%20Request%20Letter.PDF>.

Dispatchable Generation Is Integral to a Reliable System

During normal operations, electricity system balancing authorities must maintain an instantaneous balance between supply and demand. Dispatchable power plants can start up quickly, oftentimes in as short an amount of time as 10 minutes, and they can also ramp up and down quickly to balance supply and demand. Natural gas and hydroelectric power plants provide the bulk of the dispatchable power generation for California. By late summer or during drought conditions, hydroelectric power plant capacities are significantly diminished, leaving natural gas power plants as the primary dispatchable resource. For example, on August 5, 2021, the Edward Hyatt Hydroelectric Power Plant at Lake Oroville experienced its first unplanned outage since the facility began operating in 1967.

Stored renewable energy, while desirable and capable of providing some amount of dispatchable power, currently is not available in significant quantities or for long-enough duration to meet the need. For example, at 8 p.m. August 1, 2021, in the California ISO, natural gas power plants provided 18,230 MW of power, while battery storage provided only 947 MW. Furthermore, new mechanisms developed by the CPUC are available to encourage or require certain loads to leave the grid, thereby reducing immediate demand.

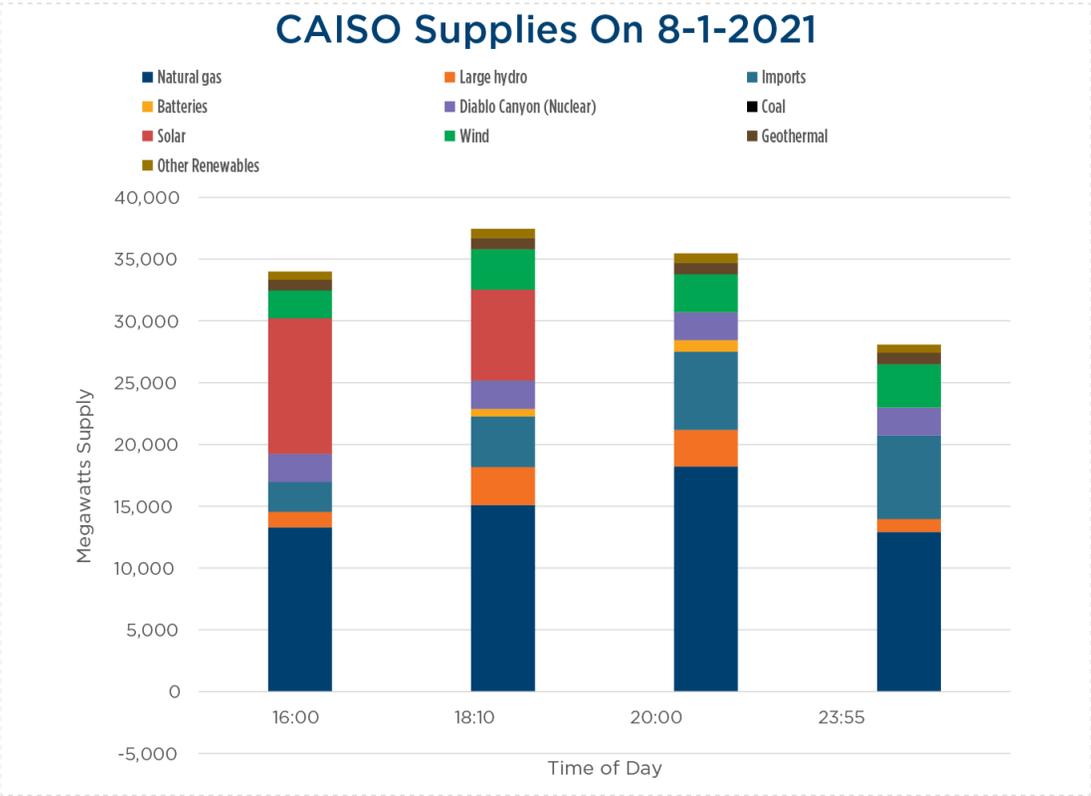
Figure 1-1: Solar Output in California ISO on August 1, 14, and 31, 2021



During energy shortfalls, dispatchable generation and load shedding are used to help provide this balance and firming the electricity system. During any typical late afternoon, even without heat waves or smoke from forest fires, solar power is not fully available because the sun is not as high in the sky as midday. Figure 1-1 shows solar production in California ISO supplies on August 1 (blue line), August 14 (brown line), and August 31 (green line) of 2021. Facility operators have confirmed that cloudy or smoky skies reduce solar production as shown in Figure 1-1 for August 14 and 31.

Next, in Figure 1-2, an example of how the resource mix on the California ISO system changed as the solar component of supply declined on August 1, 2021. As the solar supply (yellow bar) diminished between 4 p.m. (16:00) and 8 p.m. (20:00), natural gas (darker blue), large hydro (red orange) and imports (grey) all increased to offset the reduction in solar power. Note the minor contribution from batteries (lighter orange) bar. Furthermore, the nuclear supply (lighter blue bar) will be lost as the Diablo Canyon Nuclear Power plant is retired in 2023 (1,100 MW) and 2024 (another 1,100 MW).

Figure 1-2: California ISO Changing Resource Mix as Solar Generation Declined on August 1, 2021



Joint Energy Agency Root Cause Analysis

On January 13, 2021, the CEC, CPUC, and California ISO published a Final Root Cause Analysis Report describing the rotating outages that occurred on August 14 and 15, 2020, and a summary of actions each agency planned to undertake to avoid recurrence. The three agencies took responsibility for the outages and stated their joint intent to take actions to

minimize or eliminate the probability of recurrence. While the agencies concluded there was no single cause of the August outages, they found that the three major causal factors that contributed to the outages were (1) extreme weather conditions, (2) resource adequacy and planning processes, and (3) market practices. Each agency stated its intent to work cooperatively to address these issues.

The Final Root Cause Analysis report provided recommendations to all three agencies addressing immediate, near-, and longer-term improvements to resource planning, procurement, and market practices, and stated that many of these improvements are already underway. These actions are intended to ensure that California's transition to a reliable, clean, and affordable energy system is sustained and accelerated.

In the Final Root Cause Analysis Report, the CEC stated its intent to work in the near term with the CPUC and California ISO as follows:

1. The California ISO and CEC will coordinate with non-CPUC-jurisdictional entities to encourage additional necessary procurement by such entities.
2. The CEC will conduct probabilistic studies that evaluate the loss of load expectation on the California system to determine the amount of capacity that needs to be installed to meet the desired service reliability targets.
3. The California ISO, CPUC, and CEC will enhance the efficacy of Flex Alerts to maximize consumer conservation and other demand-side efforts during heat waves.
4. Preparations by the California ISO, CPUC, and CEC are underway to improve advance coordination for contingencies, including communication protocols and development of a contingency plan.

In the midterm, the CEC stated its intent to work with the CPUC and California ISO as follows:

1. Developing planning and operational improvements for the performance of different resource types (such as batteries, imports, demand response, and so forth).
2. Making improvements to accelerate the deployment and integration of demand side resources
3. Considering generation and transmission buildouts to evaluate options and constraints under the SB 100 scenarios.

This midterm planning will also account for the pending retirements of some existing natural gas units and the Diablo Canyon nuclear power plant.

For the longer term, 2025 and beyond, the California ISO, CPUC, and CEC expect to work closely together with each other and with other regional stakeholders to establish a modernized, integrated approach to forecasting, resource planning, and resource adequacy targets.

CHAPTER 2:

Evaluating and Permitting Additional Resources to Support Summer 2021 Reliability

Incremental Efficiency Power Plant Improvements Workshop

On December 2, 2020, the CEC's STEP Division hosted a Lead Commissioner public workshop titled "Incremental Efficiency Improvements to the Natural Gas Powerplant Fleet for Electric System Reliability and Resiliency." The workshop explored technology options to increase the efficiency and flexibility of the existing natural gas power plant fleet to increase California electric system reliability and provide insurance against extreme weather, fire, or climate-related events while helping smooth the transition to Senate Bill (SB) 100 goals.

Workshop participants and attendants represented a broad range of stakeholders, including investor-owned and publicly owned utilities, community choice aggregators, independent energy suppliers, power plant owners and operators, local governments, regional air districts, Disadvantaged Communities Advisory Group members, and CPUC and California ISO staff. The workshop included three expert panel discussions. The first two panels focused on technology improvements and process modifications to increase the efficiency of California's power plant fleet for electric system reliability and resiliency, and the third panel focused on finance and governance, exploring how the incremental improvements identified in earlier panels could be procured.

Vendors and owners identified and presented information on potential incremental changes specific to natural gas power plants. These changes include the potential for increased generation through project change improvements to increase peak output and reduce start times from existing equipment; and, software technology upgrades to improve ramp rate, turndown, and overall efficiency of the combustion turbines. Panelists also explained that coupling energy storage with combustion turbine modifications would also support increased flexibility and potentially reduce the number of natural gas facilities operating during peak demand times. However, panelists indicated that equipment and software lead times were long, and some upgrades would require extensive planning and design, as well as downtime for installation. Thus, timing for plants modifications could also become an issue if not planned appropriately.

The second panel included industry representatives and regulatory agencies. They expressed concerns with the existing regulatory processes and timelines in place. They noted these different local, state, and federal agencies timelines could make it difficult to realize these efficiency improvements ahead of summer 2021. Even if incremental improvements were authorized by the CPUC, reopening, and modifying existing project permits could be more timely than new construction or permitting processes. While the CEC has already implemented process improvements to facilitate project change petitions, several air districts indicated that their regulatory processes and required comment periods can be lengthy. The air districts encouraged project owners to do outreach early, define clear project descriptions, and request expedited review when necessary.

The third panel, which included the CPUC, investor-owned utilities, and the Sierra Club, focused on the feasibility of different procurement options given the near-term time frames under consideration and whether and how this procurement should occur. The CPUC discussed the recent Order Instituting Rulemaking (OIR) 20-11-003, for Summer 2021 Reliability, which is intended to increase energy supply or decrease demand during peak and net peak hours. Panelists discussed the need to address new peak and dispatchable generation, the need for clear procurement communications, and concerns over regulatory uncertainty and the impact to market stability. Panelists also discussed the retirements of once-through-cooling plants, natural gas-fired facilities, and the Diablo Canyon nuclear facility, and the associated initial impact on system reliability as the state's generation resource mix continues to change, including the addition of more renewable generation that is variable. Participants also expressed concerns over ongoing air quality impacts in disadvantaged communities.

Improvements to Energy Commission Licensed Facilities

Energy Commission Jurisdiction

The CEC has jurisdiction and permitting authority for thermal power plants 50 MW and greater in California. This jurisdiction also includes infrastructure associated with thermal power plants, including electric transmission lines, natural gas lines, and water pipelines. The CEC's permitting process ensures that proposed thermal power plants are designed, constructed, and operated in a manner that protects public health and safety, promotes the general welfare, and preserves environmental quality. The process is the functional equivalent of a California Environmental Quality Act review and includes coordination with local, state, and federal agencies to ensure that these agencies' permit requirements are incorporated. Currently, there are 76 power plants under CEC license, totaling roughly 26,600 MW. Of these, 63 are fueled by natural gas, totaling 24,044 MW.

Project Change Improvements Submitted and Withdrawn

In February 2021, in response to the CPUC's Rulemaking Order 20-11-003 directing California's three large electric investor-owned to seek contracts for additional supply-side capacity, the investor-owned utilities filed advice letters with the CPUC seeking contract approvals for 564 MW of additional generation for summer 2021. As a result, owners and operators of more than a dozen CEC-jurisdictional power plants submitted project change petitions to modify their conditions of certification in anticipation of securing procurement contracts.

The CPUC approved these contracts on March 18, 2021. Power plant owners that did not receive contracts withdrew their CEC project change petitions. An additional potential 100 MW of generation could have been available to support summer 2021 reliability; however, power plant owners were reluctant to make new investments without a CPUC procurement contract.

Project Change Improvements

STEP staff reviewed the remaining project change petitions following Title 20, California Code of Regulations, section 1769 regarding post certification amendments and changes to ensure that these project changes were consistent with all applicable laws, ordinances, regulations, and standards and would not result in significant impacts to the environment or to local communities.

STEP staff approved eight projects totaling an additional 136 MW to support electric grid reliability for summer 2021. More than 90 percent of these approved project are outside designated disadvantaged communities. These projects and modifications are discussed below, and Figure 2-1 shows the locations.

Projects Already Online Supporting 2021 Reliability



Each upgrade is summarized as follows:

The Marsh Landing Generating Station is a nominal 760 MW simple-cycle project in Contra Costa County. The project owner, NRG Marsh Landing, LLC, has been approved to install an

11.5 MW Battery Energy Storage System (BESS) capacity through modifying the design, technology, and battery chemistry of the system using a lithium ferrous phosphate battery chemistry for improved reliability and capacity requirements. The BESS is also designed to restart the power plant gas turbines to support California ISO's directed restoration of the electricity grid in response to an emergency condition, also known as a "black start" capability.

The Pastoria Energy Facility is a nominal 750 MW combined-cycle project in southeastern Kern County. The project owner, Calpine, increased output by 10 MW by making a software improvement that will allow the project to increase firing temperatures in order to increase the output efficiency. Firing temperatures will be increased only when additional MWs are needed to meet peak demand. Pastoria was one of the first projects to upgrade hot gas components to improve performance in 2012.

The Palomar Energy Project is a nominal 565 MW combined-cycle project in north San Diego County. The Palomar Energy Project owner, San Diego Gas & Electric, increased output by 22 MW by upgrading with advanced gas path technology.

The Roseville Energy Park is a nominal 160 MW combined-cycle power plant owned by the City of Roseville. It recently increased output by 5 MW by installing a comprehensive combustion turbine upgrade to the natural gas-fired turbines and a control software system upgrade. This reduced the turbine heat rate, which allows for an increase in capacity from the same amount of fuel.

The Otay Mesa Energy Center is a nominal 600 MW combined-cycle project owned by Calpine Corporation. The project increased output by 10 MW by upgrading the control logic systems on the natural gas-fired turbines to allow for increased firing temperatures, if needed.

The Metcalf Energy Center is a nominal 605 MW combined-cycle project in Santa Clara County. The project owner, Calpine, increased output by 30 MW through equipment and software upgrades that reduce the turbine heat rate, which allows the project to generate more power from the same amount of fuel.

The Walnut Creek Energy Park is a nominal 500 MW simple-cycle (peaking) project. The project owner, Clearway Energy, increased project output by 17.4 MW through dual amendments with CEC and the South Coast AQMD for Units 1–5. The increased output is tied to increased fuel input and ammonia flow rate to the selective catalytic reduction emission control system.

The El Segundo Energy Center is a nominal 560 MW combined-cycle plant using the fast-start, air-cooled Siemens SGT6-5000 F package. The project owner, Clearway, increased output by 30 MW by upgrading combustion turbine logic controls enabling the power plant to increase the fuel input.

Additional Capacity Approved by CEC but Not Yet Built

The CEC has approved additional units that could be built at several existing CEC jurisdictional facilities. The additional units have not been constructed, as the owners of the plants do not have contracts to for the additional capacity. Figure 2-2 shows these facilities and locations, and the text below summarizes them.

Figure 2-2: Additional Capacity Approved by CEC but Not Constructed

POWER PLANT PROJECTS PERMITTED BUT NOT BUILT

CEC Permitted Projects at Existing Facilities Could Bring Online an Additional

1200 MWs

- Alamitos Energy Center
 - ◆ Huntington Beach Generating Station
 - Carlsbad Energy Center Project
 - ★ Cosumnes Power Plant
- ⚡ Phase 2 = 400 MW
 - ⚡ Phase 2 = 200 MW
 - ⚡ 6th Train = 100 MW
 - ⚡ Phase 2 = 500 MW



The Alamitos Energy Center (AES Alamitos Energy Center) was proposed as a nominal 1,040 MW, natural-gas-fired, combined-cycle and simple-cycle, air-cooled electrical generating facility consisting of two power blocks. Both blocks were approved by CEC on April 12, 2017. Block 1 is a two-on-one combined-cycle facility with a total generating capacity of 640 MW, which began commercial operation in February 2021. Block 2 was proposed as four natural gas-fired simple cycle turbines with a generating capacity of 400 MW, but it has not been constructed.

The originally permitted Huntington Beach Energy Project (HBEP) was a natural-gas fired, combined-cycle, air-cooled, 939 MW electrical generating plant to replace the former Huntington Beach Generating Station. As licensed, HBEP would have consisted of two independently operating, three-on-one, combined-cycle gas turbine power blocks. On April 1, 2017, an amendment to the decision was approved that changed the project to an 844 MW power plant to be constructed in two phases. Phase 1, which began commercial operation on June 25, 2020, consists of two natural-gas-fired combustion turbine generators in a combined-cycle configuration to produce a nominal 644 MW. Phase 2, which has not been constructed, would add two GE simple-cycle gas turbines with a nominal capacity of 200 MW.

The Carlsbad Energy Center (NRG Energy, Inc) was proposed as a plant consisting of six simple-cycle turbines totaling 600 MW. The project was approved by the CEC on July 30, 2015, and five of the six turbines entered commercial operation by December 2019. Only five

combustion turbine generators (CTGs) with a total net output capacity of about 527 MW have been constructed. The sixth train would add nearly 100 MW, but it has not been constructed.

The Cosumnes Power Plant was licensed September 9, 2003. It was originally proposed as a two-phase, 1,000 MW project with each phase consisting of two combined-cycle combustion turbines, one condensing steam turbine, and two heat recovery steam generators with a capacity of 500 MW. Only one phase was approved for construction and became operational February 24, 2006. In 2018, installation of advanced gas path components was approved to increase the total output by nearly 70 MW. The second 500 MW phase of the project can only be constructed if the project owner files a new Application for Certification with review being limited to Air Quality, Water Resources, and Transmission System Engineering unless any circumstances identified in the CEQA guidelines, section 15162(a)(1)-(3) have changed.

Additional Outreach

Communication with Jurisdictional Power Plants

With the likelihood that California would face possible heat waves in 2021, communication with power plant owners and operators is critical. Unlike California ISO's curtailment and nonoperational balancing authorities' reporting requirements and the CPUC's Power Plant Outage Reporting portal requirements, the CEC does not have the statutory authority to require jurisdictional facilities to report real-time unplanned or forced outages. CEC staff worked with power plant owners and operators to coordinate and implement, as necessary, measures to enable additional generating capacity during high summer demand.

CEC staff developed new protocols to communicate with plant owners and the California ISO in the event of emergencies. The California ISO works directly with power plants to notify them of potential events via a "heat wave bulletin" up to a week ahead of time and more frequently as an event is developing. CEC staff communicated with all 76 jurisdictional power plant owners ahead of and during extreme weather conditions and Flex Alerts to inform them that an energy emergency may be developing, request they coordinate closely with the California ISO, and notify the CEC of any issues or concerns with their facility. If an energy emergency is declared, CEC staff informs project owners, provides information regarding any emergency waivers and emission limit waivers, and requests that they closely coordinate with California ISO and report project issues or outage information to the CEC. This communication between staff and power plant owners allowed staff to identify facilities impacted by unplanned outages and helped identify if and where potential additional capacity could be available to support reliability by operating during periods of high peak demand.

Jurisdictional Fleet Survey

To understand if additional opportunities for additional capacity might be available to support system reliability in 2021 and 2022 during peak demand, CEC staff surveyed CEC-jurisdictional power plants. The objective of the survey was to understand the potential for power plant improvements that could increase electric system reliability, enhance resiliency, and improve the integration of intermittent resources. CEC staff sought to understand what additional efficiency improvements, project upgrades, battery energy storage system expansions, or opportunities to locate temporary power generator units at existing natural gas-fired facilities might be possible. Ninety percent of CEC-jurisdictional projects responded and provided

information on potential additional capacity that may be available in summer 2021, as well as for summer 2022 through 2026. Roughly 200 MW additional of capacity may be available by summer of 2022, of which 80 percent would be outside designated disadvantaged communities.

Second Lead Commissioner Public Workshop

On August 30, 2021, the CEC's STEP Division participated in another Lead Commissioner public workshop titled "Midterm Reliability Analysis and Incremental Efficiency Improvements to Natural Gas Power Plants." The STEP portion of this workshop focused on longer-term efficiency improvement options expected to be needed for 2022 and beyond to support electric grid reliability, including a discussion of incremental efficiency improvements potential for natural gas power plants. This ongoing work is being performed in collaboration with the CPUC to help inform a preferred system plan decision expected later this year.

STEP staff discussed actions the CEC has taken to increase the generating capacity of its jurisdictional power plants since last summer and identify the permitted and potential MW that could be available in the near term. STEP staff summarized the facilities in the existing fleet of CEC-licensed facilities, summarized the outreach and jurisdictional fleet survey efforts described above, and the process approval change implemented to speed up the review and approval of capacity upgrades in support of improved system reliability over the next few years. Staff also summarized the December 2, 2020, workshop described earlier, and the staff worked with facility owners to obtain additional capacity for 2021 and beyond. STEP staff also described the Governor's executive order described in Chapter 3. Finally, STEP staff summarized the additional facility upgrades being considered for 2022 and beyond.

CHAPTER 3:

2021 Emergency Orders and Continued Efforts to Support System Reliability

On June 17, 2021, Governor Newsom proclaimed a state of emergency⁷ because of an extreme heat wave that began June 16, 2021. This order extended through midnight on June 22, 2021. The provisions of this order mirrored the orders of August 16 and 17, 2020.

On July 30, 2021, Governor Newsom proclaimed another state of emergency⁸ because of sudden and severe energy shortages in California resulting from extreme drought, wildfires, and record-breaking heat events. The proclamation declared that California faces a projected energy supply shortfall of up to 3,500 MW in 2021, and a shortfall of up to 5,000 MW in summer of 2022.

In the event California ISO declares a state of emergency between August and October 2021, these would be allowed:

1. Utility companies shall pay incentives for large energy users to reduce demand.
2. Emergency power equipment may operate.
3. Power Plants needing to exceed permit limits to increase power production may do so.
4. Ocean vessels docked in port may use onboard diesel-fueled power rather than grid power.
5. CARB to develop a plan to reduce emissions that exceed permit limits.
6. Department of Water Resources to enter contracts with entities that are able to add capacity by October 31, 2021.
7. CEC to expedite post-certification petitions for changes in design, operation, or performance requirements of existing facilities to increase MW capacity.
8. CEC to expedite the siting of emergency and temporary power generators of 10 MW or more.
9. CEC to expedite the siting of new battery energy storage systems of 20 MW or more that can discharge for at least two hours.
10. CEC, in consultation with the CARB, the California ISO, and the CPUC, to identify and prioritize action on recommendations in the March 2021 Senate Bill 100 Joint Agency Report, and any additional actions, that would accelerate the state's transition to carbon-free energy.

⁷ [Proclamation of a State of Emergency, June 17, 2021](https://www.gov.ca.gov/wp-content/uploads/2021/06/6.17.21-Extreme-Heat-proclamation.pdf)

<https://www.gov.ca.gov/wp-content/uploads/2021/06/6.17.21-Extreme-Heat-proclamation.pdf>.

⁸ [Proclamation of a State of Emergency, July 30, 2021](https://www.gov.ca.gov/wp-content/uploads/2021/07/Energy-Emergency-Proc-7-30-21.pdf)

<https://www.gov.ca.gov/wp-content/uploads/2021/07/Energy-Emergency-Proc-7-30-21.pdf>.

California Energy Commission Emergency Responsibilities

Governor Newsom’s emergency proclamation directed the CEC to work with the state's load-serving entities on accelerating plans for the construction, procurement, and rapid deployment of new clean energy and storage projects. The emergency proclamation addresses the climate-induced energy shortfall and specifically requires the CEC to develop procedures to expedite three directives as follows:

1. Expedite post certification petitions for changes in the design, operation, or performance requirements of existing facilities under the CEC’s jurisdiction.
2. License emergency and temporary power generators of 10 MW or more.
3. License battery storage systems of 20 MW or more that can discharge for at least two hours.

Expedited Facility Change Petition Process

The first two directives of the emergency proclamation apply to projects that can reduce the energy shortfall or deliver net peak capacity by the end of October 2021.

The Expedited Facility Change Petition Process suspends Title 20, section 1769 of the California Code of Regulations. The CEC order implementing this provision was approved by the CEC on August 17, 2021. It provides an alternative process for facility change requests. The order specifies required information that the petition must contain, including a detailed description of how the facility change would contribute to near-term reliability needs by October 31, 2021.

The authority to approve these petitions is delegated to the executive director. The executive director’s decision must be made within 10 working days of receiving a completed petition, and the decision is final and not subject to appeal.

Temporary Power Generator Licensing

The second directive of the emergency proclamation, known as the Temporary Power Generator Licensing Program, expands CEC’s authority under the Public Resources Code sections beginning with section 25500. It provides CEC the authority to establish a streamlined process for approving licenses for temporary power generators of 10 MW or more that the CEC determines will deliver net peak energy before October 31, 2021.

The temporary power generators must meet criteria set forth in the proclamation and specified in the order approved by the CEC on August 17, 2021. For a project to be considered under this program, applicants must complete and submit to the CEC a self-certification template for a license. Within 10 days of receiving an applicant’s completed self-certification form and appropriate documentation, the executive director shall file a decision on the self-certification application either granting or denying the license. The decision is final and not subject to appeal. Licenses are valid for up to five years.

Battery Storage System Licensing

The third directive of the emergency proclamation applies to battery storage system projects that can deliver net peak energy by October 31, 2022. Recent feedback from CEC-jurisdictional plants indicates that there is potential for an additional 900–1,100 MW available from new and expanded battery storage between 2022 to 2026 to support midterm reliability.

Known as the Battery Storage System Licensing Program, this directive expands the CEC’s authority under the Public Resources Code sections beginning with section 25500. It directs the CEC to establish an expedited process for approving licenses for new or expanded battery storage systems of 20 MW or more. The CEC must determine that eligible projects are capable of discharging for at least two hours and will deliver net peak energy no later than October 2022.

As a result of all the actions taken by the CEC, future mid-term reliability capacity includes efficiency and equipment upgrades, battery energy storage system expansions, and permitted projects constructed totaling more than 1,500 MW of new generation as shown in Figure 3-1.

Figure 3-1 Permitted and Potential Capacity 2022–2026



The projects resulting from these orders will help reduce the strain on the state’s energy infrastructure, increase energy capacity, and increase the reliability and resiliency of California’s energy supply.

GLOSSARY

APPLICATION — Any request for certification of any site and related facility filed in accordance with the procedures established under this division.

BASE LOAD — The lowest level of power production needs during a season or year.

BATTERY — A device that stores energy and produces electric current by chemical action.

CAPACITY — The amount of electric power for which a generating unit, generating station, or other electrical apparatus is rated either by the user or manufacturer. The term is also used for the total volume of natural gas that can flow through a pipeline over a given amount of time, considering such factors as compression and pipeline size.

COMBINED-CYCLE PLANT — An electric generating station that uses waste heat from its gas turbines to produce steam for conventional steam turbines.

ENERGY RESOURCES — Everything that could be used by society as a source of energy.

FOSSIL FUEL(S) — Oil, coal, natural gas, or associated by-products. Fuel that was formed in the earth in prehistoric times from remains of living-cell organisms.

GENERATING STATION — A power plant.

GRID — The electric utility companies' transmission and distribution system that links power plants to customers through high-power transmission lines.

MARKET FORCES — Entities that participate in the energy marketplace through the buying, selling, transmission, or distribution of energy or ancillary services into, out of, or through the California ISO-controlled grid.

MEGAWATT (MW) — One thousand kilowatts (1,000 kW) or 1 million (1,000,000) watts. One megawatt is enough electrical capacity to power 1,000 average California homes.

NATURAL GAS — Hydrocarbon gas found in the earth, composed of methane, ethane, butane, propane, and other gases.

OUTAGE (Electric utility) — An interruption of electric service that is temporary (minutes or hours) and affects a relatively small area (buildings or city blocks).

PEAK LOAD — The highest electrical demand within a particular period. Daily electric peaks on weekdays occur in late afternoon and early evening. Annual peaks occur on hot summer days.

PERMIT — Written authorization from a government agency (for example, an air quality management district) that allows the construction or operation or both of an emission generating facility or related equipment within certain specified limits.

POWER PLANT — A central station generating facility that produces energy.

RELIABILITY — Electric system reliability has two components: adequacy and security. Adequacy is the ability of the electric system to always supply the aggregate electrical demand and energy requirements of the customers, considering scheduled and unscheduled outages of system facilities. Security is the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system facilities.

THERMAL POWER PLANT — Any stationary or floating electrical generating facility using any source of thermal energy.