

BUILDING THE ELECTRICITY GRID OF THE FUTURE: CALIFORNIA'S CLEAN ENERGY TRANSITION PLAN



Governor Gavin Newsom
May 2023

Table Of Contents

- Preface** 2
- Executive Summary** 3
- California’s Climate and Clean Energy Goals** 8
- Implementing California’s Clean Energy Transition** 10
 - i. Planning for California’s High Electrification Future 10
 - Electric Resource Planning 10
 - Maximizing Electricity Demand Flexibility 11
 - Modernizing California’s Grid and Accelerating Connection of Clean Electric Resources 12
 - ii. Deploying an Unprecedented Scale of New Clean Electric Resources14
 - Permit Streamlining14
 - Procurement of Diverse Clean Electricity Resources 15
 - iii. Ensuring Electric Grid Reliability During Extreme Weather 17
 - iv. Customer Electric Bill Affordability..... 18
 - Electric Rates and Equity 18
 - New Financing Models to Reduce the Upward Trajectory of Electric Rates..... 20
 - Creating Efficiencies Through Regional Grid Cooperation and Coordinated Operations 20
 - New Technologies and Prioritizing Equitable Electric Bill Affordability 20
- Conclusion: The Path Toward California’s Clean Energy Future** 21

Preface

California's Electricity System of the Future

In July 2021, Governor Gavin Newsom released California's Electricity System of the Future, a roadmap to a future where clean electricity increasingly powers the daily lives of Californians. As California reduces greenhouse gas (GHG) emissions from the state's electricity system (that is, the electric grid), the state must also keep costs reasonable and plan thoughtfully to ensure that electric service is affordable and reliable for all.

The vision for a clean electric grid of the future is one where:

- The electric grid is powered by low-cost, carbon-free electricity at all hours of the day and night, making clean electricity accessible to all Californians.
- Transportation choices are zero-emission and able to plug into the electric grid at places of convenience for all customers.
- Buildings are increasingly decarbonized.
- The industrial sector is powered by clean electricity and clean fuels, such as hydrogen.
- Advanced communication and digital technology enable seamless customer demand flexibility that supports electric grid reliability and helps keep electric service costs more affordable for all customers.

California's Electricity System of the Future recognized the need to build clean electric generation and energy storage at an unprecedented pace and scale. It was a

call to action to harness the potential of some of the emerging technologies and electric grid concepts that underlie the equitable transition to a 100 percent clean, resilient electric grid.

This document shows how the state is implementing this vision to meet our 100 percent clean electric future, and addressing the reliability challenges of extreme events driven by climate change to equitably deliver a clean, safe, reliable, and affordable energy transition for all Californians.

Executive Summary

California's clean energy agenda is ambitious, and we are exceeding many of our preliminary targets years ahead of schedule. But to reach our ultimate goal of 100% clean electricity by 2045, we need to build more clean energy, faster. Electrifying California's economy and building a reliable, safe, affordable, and clean electric grid are cornerstones of both our climate leadership and our economic plan for the future.

We are in a Race Against Climate Change

The state's electric sector is at an inflection point. California still depends on fossil gas-fired electric generation to maintain a reliable electric grid. The old electric grid was largely stable with predictable demand patterns and little load growth - but climate change has made our old grid more vulnerable and created greater urgency to modernize it.

Our modernized electric grid will be less vulnerable to extreme heat events, wildfires, droughts, and floods, while meeting the needs of California's future.

California's energy transition is well underway, with nearly 35,000 MWs of renewable resources already serving the grid, and 9,000 megawatts (MW) of that capacity coming on-line in the last three years. To provide 100% clean electricity, current studies show California will need to build an additional 148,000 MW of clean energy resources by 2045. The new grid will continue to innovate energy demand side resources by increasing energy efficiency, adoption of customer solar and storage, and utilize technologies that allow customers to supply power stored in their zero-emissions car batteries and other sources back to the grid. Optimizing demand side resources creates greater grid efficiencies and advances our goals of affordability and reliability.

But the only way to achieve our goals is to build more clean energy, faster. This is a roadmap to how the state will increase our current clean electricity capacity by 400% over the next two decades.

Goals set, goals met



33% renewable energy



Reduce greenhouse gas emissions to 1990 levels



1.5 million zero-emission vehicles sold



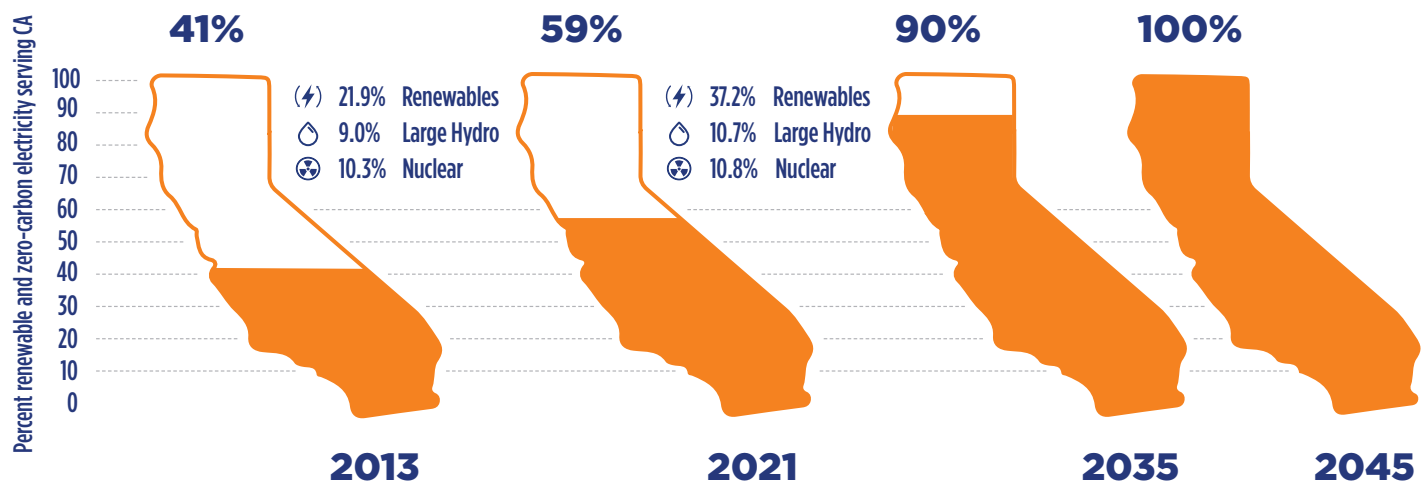


California is Leading the Clean Energy Revolution

California has kickstarted the transition away from dirty fossil fuels. Our success comes from setting a vision for our future, putting that vision into public policy, and investing in innovation and technology to help us reach our goals.

Our state established a landmark policy (SB 100, 2018) requiring 100% of our electricity to come from renewable energy and zero-carbon resources by 2045. This plan marks our progress toward that ultimate goal and identifies what is needed to reach 100% clean electricity by 2045. It outlines what we can expect in the years ahead, as we begin the next phase of California's transition to clean electricity.

California is on track to achieve 100% clean electricity with 59% of the state's electricity already coming from renewable and zero-carbon resources



California is Creating Modern Rules to Build a Modern Electrical Grid

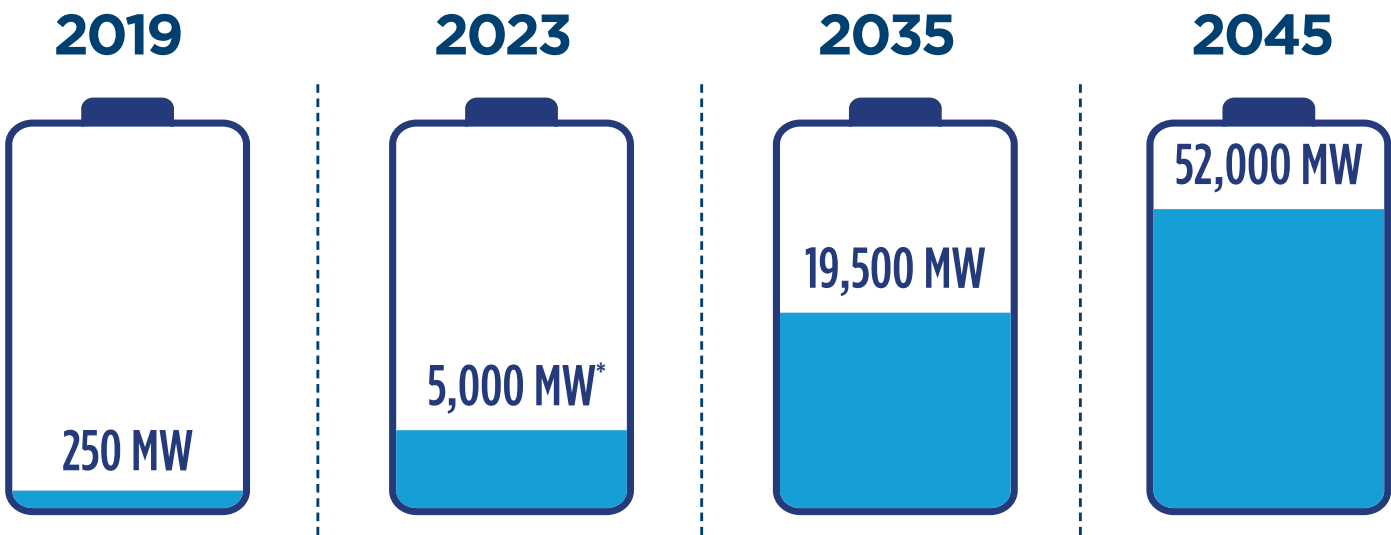
In the next phase of the clean energy transition, our focus is to generate an unprecedented amount of clean, reliable power – and to keep it affordable.

Modernizing our electric grid means adapting to how these newer forms of power differ from older, dirtier sources. For example, newer, clean sources of electricity like solar and wind energy are more variable and more intermittent. We will not be able to build a reliable, clean electric grid using solar and wind energy alone. California needs more diverse clean energy resources – including batteries, clean hydrogen, and long-duration storage – and a wide range of technologies and resources to meet the unprecedented growth in demand for electricity at all hours of the day and different times of year.

Last year, California passed important regulatory reforms that will make it easier to build thousands of new MWs of clean electric generation. The state has a comprehensive electric generation and energy storage procurement planning process and is making it easier to fast-track new clean energy projects. Our state is also investing in connecting and delivering these clean energy resources to California consumers. Now, we must get to work and build the clean energy projects that help us reach our goals.

Energy efficiency and technology will also be critical. Customers will have increased ability to voluntarily and automatically reduce electricity use to provide power back to the grid when demand is high. State incentives to harness the “smart” capabilities of cars, household appliances, and other equipment will reduce strain on our electric grid and help customers reduce their electric costs. The electrical grid of the future will be smart and dynamic, with buildings and vehicles providing power back to the grid during peak hours, and charging during times of relatively low demand.

California’s growing battery storage capacity *captures the state’s abundant renewable resources*



*Projected as of June 1, 2023, based on California ISO interconnection queue.

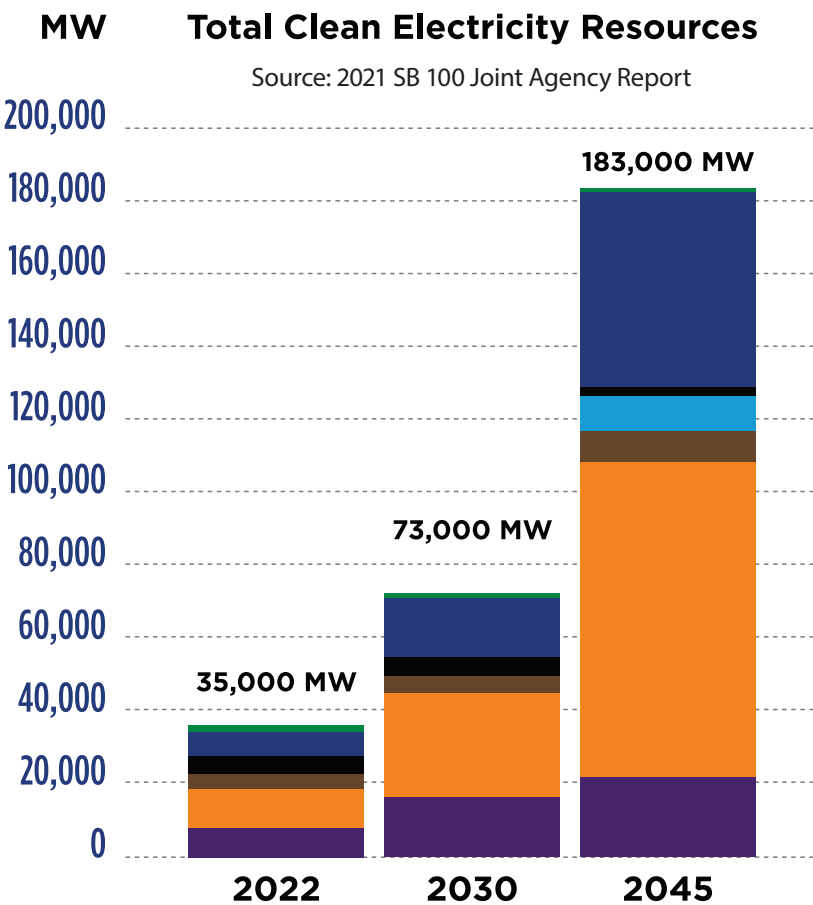
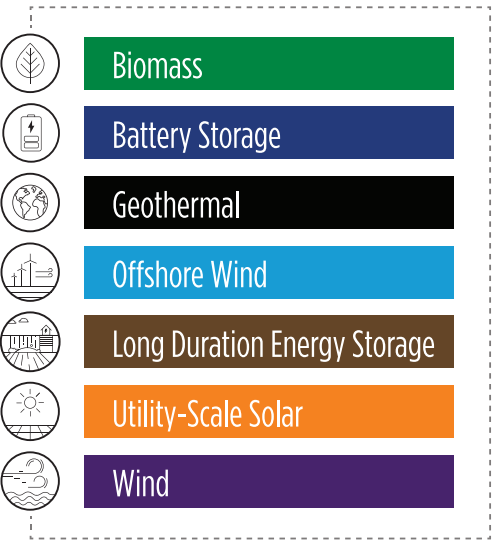
California Has a Plan to Manage the Transition to Clean Energy

The transition to a 100% clean electric grid will come quickly, but not overnight. Maintaining reliable and affordable electric service throughout this transition is just as important. Public health and safety, the economy, and the future of the state and this planet all rely on this transition. This transition is ambitious in scope and scale, but is achievable with California’s innovation culture as well as clear, consistent policies that allow us to build the grid we need and provide economic opportunity for all Californians.

To provide 100% clean electricity by 2045, *California will build an unprecedented amount of new utility-scale clean energy resources*

Totals represent new and existing resources. The 2021 SB 100 Joint Agency Report projects the need for 148,000 MW of new resources by 2045.

In addition, California also expects new capacity from energy efficiency, customer solar and demand response.



California's Climate and Clean Energy Goals

California has a unique opportunity to build upon the state's history of innovation, economic growth, and science-based policymaking to lead global efforts to adapt to and mitigate climate change.

The state is positioned to simultaneously confront the climate crisis and build a more resilient, just, and equitable future for all communities through a bold suite of climate goals including:

- Carbon neutrality by 2045
- 100% clean electricity by 2045
- 25,000 MW of offshore wind by 2045
- 100% ZEV new car sales by 2035
- 7 million climate-friendly and climate ready homes by 2035
- 6 million heat pumps in buildings by 2030

In 2022, the California Air Resources Board (CARB) adopted an update to the state's climate plan - leading the world with a comprehensive roadmap to achieve net zero pollution.

The Plan is Expected to Yield Major Benefits for Californians



Cut Air Pollution
71%



Slash Greenhouse
Gas Emissions
85%



Drop Gas
Consumption
94%



Create New Jobs
4 Million



Save Californians in
Health Cost from
Pollution
\$200 Billion

Source: California Air Resources Board

California's zero-emission vehicle market is accelerating

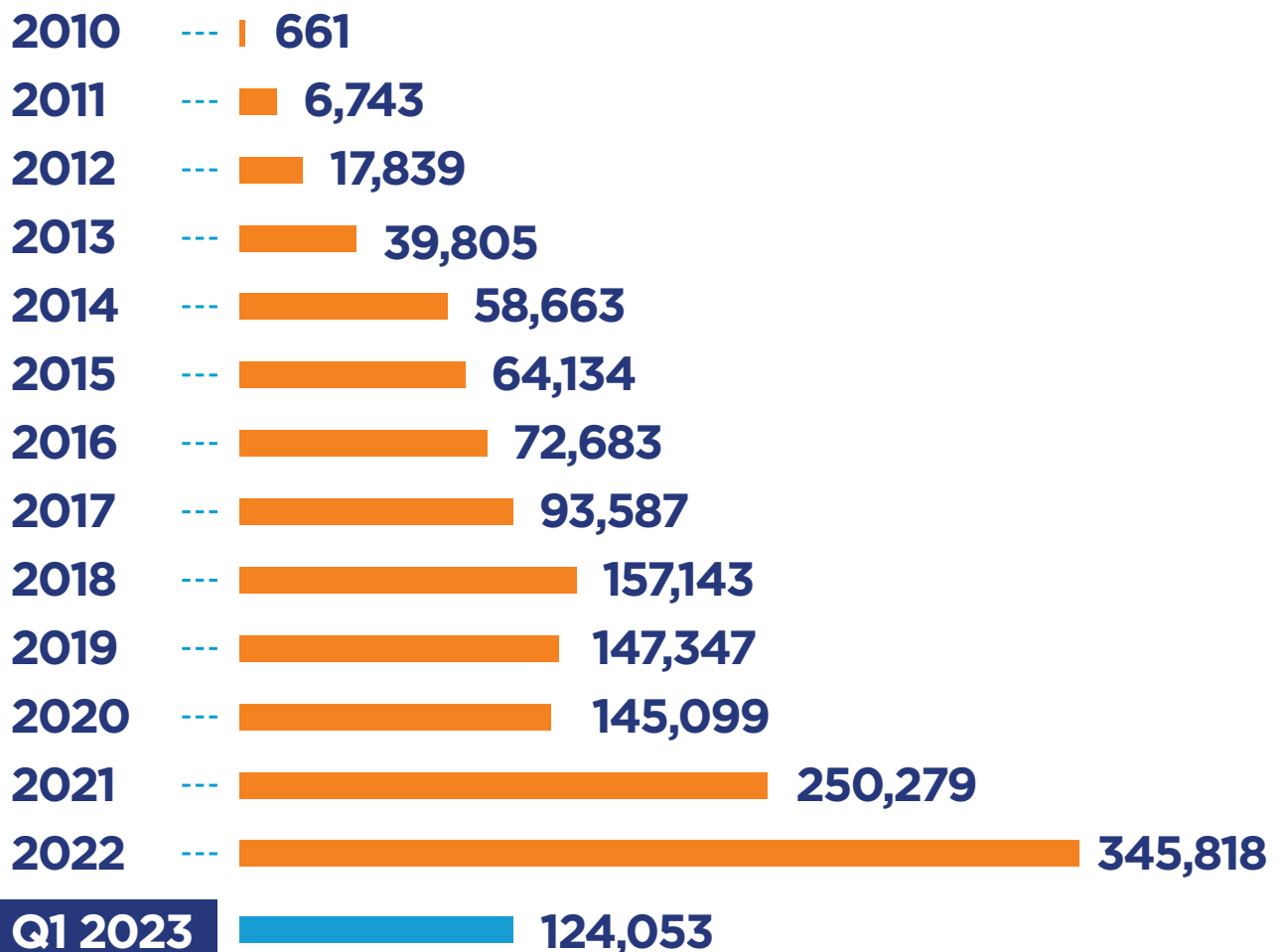
as the state drives toward the phase-out of sales of new gasoline-powered vehicles by 2035

California is focused on transforming the transportation sector, which is responsible for more than half of the state's climate emissions. As outlined in this energy transition plan, the state is closely coordinating planning between the power and transportation sectors.

ZEV Market Share



Over 1.5 Million ZEVs Sold



In 2030, electric vehicle charging is expected to account for less than 5% of peak demand.

Implementing California's Clean Energy Transition

i. Planning for California's High Electrification Future

California is on a path to achieve 100% clean electricity by 2045. Through the SB 100 process, California will track our ongoing progress, continue to conduct rigorous analysis of implementation considerations, as well as coordinate planning across state agencies to meet 100% clean electricity by 2045. The next Joint Agency SB 100 Report, due January 1, 2025, will lay out the pathways to achieve SB 100 reliably, affordably, and equitably. Achieving SB 100 for all Californians, while maintaining affordability and reliability is the guiding policy for resource planning and evolving the grid of the future.

Electric Resource Planning

Building a clean electric grid that supports widespread electrification of California's economy starts with planning for future electricity demand that is growing and increasingly responsive to real-time electric supply conditions.

The California Public Utilities Commission (CPUC) implements programs designed to ensure the more than 40 electric retail sellers that serve 75% of the state's electricity demand procure enough electricity generation resources to meet their share of the forecasted electricity demand. These planning programs include the Integrated Resource Planning (IRP) process, which identifies the optimal mix of new electric resources needed to meet the state's clean electricity goals. These resources include energy storage that can capture excess power from solar and wind for later use.

Since 2019, the IRP process has resulted in the procurement of 18,800 MW of new, clean electricity generation and energy storage resources expected to come on-line through mid-decade. In addition, the CPUC's resource adequacy program ensures that electric retail sellers under CPUC's jurisdiction have enough electricity generation resources under contract and available to serve their forecasted electricity demand for each month of the year. Sellers must also hold a carefully designed reserve to serve as a cushion for unanticipated conditions, such as unplanned outages of electric resources and extreme weather events that may cause demand surges.

In addition to these processes and programs, and in close coordination with the CPUC and CEC, the California Independent System Operator (California ISO) develops a 10-year Transmission Plan that identifies a suite of electric transmission projects that may be needed for electric grid reliability, economic benefit, and policy-driven purposes.

This plan ensures that enough electric transmission capacity is available to convey power produced by the new clean electric resources that electric retail sellers are procuring to meet their IRP requirements.

The more than 40 publicly owned electric utilities (POUs) also adhere to a similar IRP process that is managed by the CEC. Through this process, the electric POUs outline strategies for achieving state goals at the least cost to customers, while maintaining electric service reliability. These IRPs are adopted by each utility's governing board and submitted to the CEC every five years.



Maximizing Electricity Demand Flexibility

In this clean energy transition, Californians will increasingly utilize novel and innovative tools to voluntarily control their electricity consumption to save on customer bills and maximize grid efficiencies. These demand flexibility opportunities increase the resources on the grid and correspondingly reduce the need to build additional resources.

A foundational component of fostering this flexible electricity demand is “smart meters.” California’s large investor-owned utilities (IOUs) led the nation in installing 12 million smart meters, enabling customers to better manage

their electricity demand through time-varying electric price signals or demand response programs. This transformative investment allows California to advance demand flexibility.

In addition, demand management standards, advanced rate design, and flexible appliance standards are helping create a vibrant marketplace of demand flexibility solutions. This provides more options for customers to manage their appliances, equipment, and devices to save money on electric bills and participate in energy conservation programs when the grid is stressed with high demand during extreme heat events.

The CEC is improving tracking of electric consumption data and addressing key limitations in planning models by:

- Enhancing climate/temperature scenarios.
- Interpreting interval electric consumption meter data to develop insight into temporal and geographical changes in electric usage.
- Expanding electrification modeling scenarios, including when, where, and how much.

Modernizing California's Grid and Accelerating Connection of Clean Electric Resources

California is strategically building new and upgrading aging transmission and distribution infrastructure to meet the rapid grid expansion needed by 2045. The CEC and CPUC are working with the electric utilities and stakeholders to enhance planning tools, improve delivery processes, and target investments in key areas of the grid.

Transmission System

California is preparing and anticipating the growth of clean electric resources that will connect to the grid. To support the timely delivery of clean energy resources, the CEC, CPUC, and California ISO have critical and interrelated roles in transmission development and upgrade projects: the CEC's electricity demand forecasts, the CPUC's IRP process, and the California ISO's annual transmission planning process.

The modernization and coordination of these processes are essential to improving efficiencies that will allow the rapid pace of interconnection of new clean energy resources. In December 2022, the CEC, the CPUC, and the California ISO signed a memorandum of understanding (MOU) to memorialize the critical collaboration of these energy institutions to coordinate processes and enable vital efforts to accelerate the identification of and preparation for new clean electricity resources that will connect to the grid.

To further the state's electric grid planning efforts, the California ISO developed and released its first-ever 20-Year Transmission Outlook in 2022. The Outlook explores longer-term electric grid requirements and options for meeting the 100% clean electricity by 2045 goal. The outlook used scenarios developed by the CEC, CPUC, and California ISO to allocate and map a potential set of new carbon-free and renewable electric resources for 2040 in alignment with the 2045 goal. The California ISO is working with the CPUC and CEC on the parameters for an update and will be releasing a new outlook in early 2024 that extends to 2045.

In May 2023, the California ISO Board of Governors approved the 2022-2023 10-year transmission plan that is notable for approving the largest tranche of new transmission in the California ISO's history. The plan includes 45 projects, totaling \$7.3 billion in new investments in the transmission grid, aligned with the direction established in the 2022 20-Year Outlook. The plan also reflects a more proactive and strategic approach to studying and recommending new transmission infrastructure needed to reliably and efficiently meet California's clean-energy objectives over the next decade, establishing the zones targeted for resource development and proactive transmission development that will shape future resource interconnection and procurement.

In addition – consistent with the strategic direction established in the MOU – the California ISO is transforming its interconnection process so that it better coordinates electric resource planning and development with new and existing electric transmission and the subsequent queuing of projects in its interconnection application review and study processes.

Distribution System Upgrades

To accommodate electrified end uses and distributed energy resources, upgrades to the electric distribution system are needed and must match local needs. These upgrades, which are paid for by customer bills, require a higher degree of planning than in the past to be equitable, timely, and cost-effective. Every electric utility, including publicly-owned and the electric investor-owned utilities, are modernizing the planning processes of their electric distribution grids to better identify current and future electricity demand. The CEC and CPUC will continue to explore strategies where distributed energy resources and demand management technologies can best be used to support electrification while minimizing costs to customers.

The CPUC continues to work with the large investor-owned electric utilities to identify and refine their interconnection processes tariff to expeditiously connect new distributed energy resources. Some of these accomplishments include the incorporation of improved analytical tools, the creation of a fast track process to streamline project delivery, and facilitating interconnection process automation. The CPUC also hosted an Interconnection Discussion Forum, bringing together utilities, developers, and other stakeholders to explore a wide variety of issues related to interconnection practices and policies to foster proactive, constructive communication, share information and best practices, and informally resolve or prevent interconnection disputes, including the designation of ombudsman for each utility for resolution of interconnection disputes. The CPUC is currently in the process of updating distribution planning frameworks to leverage enhanced data to inform distribution planning and supplement communication between utilities and

local governments to inform long-term distribution planning and support interconnection and energization. These enhancements will sustain continued growth in building and transportation electrification in addition to economic growth and new housing.

The work to integrate distributed energy resources will also support efforts to expand a workforce that is trained, skilled, and capable of constructing the needed infrastructure to accomplish these objectives.



Implementing California's Clean Energy Transition

ii. Deploying an Unprecedented Scale of New Clean Electric Resources

There is much to celebrate in California as carbon-free and renewable electric technologies and resources are flourishing, electricity demand is becoming more flexible, and the use of fossil-fueled electric generation has declined.

At the same time, California still depends on gas-fired electric generation to maintain a reliable electric grid. This dependency is especially true in the early to late evenings when electricity demand remains high while solar generation drops off and before onshore wind electric generation ramps up. Given that most of California's gas-fired electric generators are in or near disadvantaged communities, reducing reliance on these facilities is also a matter of equity. Going forward, California will build a diverse clean energy portfolio with firm, flexible resources as well as increased energy storage to guarantee reliability 24 hours a day, 365 days a year. Such resources include:

- Offshore wind turbines that can capture the powerful and sustained ocean wind.
- Increased amounts of energy storage, including batteries, clean hydrogen, and long-duration energy storage, capable of storing large amounts of energy that can provide power back to the electric grid over a consistent and continuous period.

Realizing California's clean electricity goals reliably, affordably, and equitably requires an unprecedented scale of new clean, diverse electric resources to match electricity demand growth. This acceleration requires rethinking and updating permitting, procurement, and project development processes to bring clean energy infrastructure on-line quickly.

Permit Streamlining

Improving state and local permitting is necessary to expedite the needed pace of building new clean electric resources. To that end, Assembly Bill 205 (Chapter 62, Statutes of 2022) established a new, voluntary environmental review permitting process for clean electric resources at the CEC that will provide greater certainty on timing. It will hold the environmental review process to a maximum of 270 days from when a permit application is deemed complete. The bill also established a 270-day judicial review target if projects are litigated and does so while maintaining a robust public and environmental review process.

Eligible projects include:

- Clean electric generation projects
- Energy storage systems

- Non-fossil/non-nuclear thermal plants
- Facilities that manufacture or assemble renewable energy/energy storage systems or components

Under this "opt-in permitting process," CEC certification is in lieu of most other local, state, and regional permits. Finally, this new process requires projects to include skilled and trained standards for workforce, community benefits, and local fiscal benefits, increasing opportunities for public engagement and local benefits.

Procurement of Diverse Clean Electricity Resources

Most of the new electric generation procured to date has been solar, energy storage, and wind. While solar is the predominant electric generator during the day, as the sun sets, natural gas-fired generators ramp up power production to meet peak demand in the evening and before onshore wind generators start to produce in the later nighttime hours.

As the electric grid decarbonizes, clean electric resources that can store excess onshore wind and solar power and are "on call" to deliver electricity are essential to maintaining electric grid reliability at all times. The state has initiated the development of new long-duration energy storage technologies and clean "firm" electric resources capable of generating power continuously. For example, the CEC's Long-Duration Energy Storage Program is providing \$140 million to long-duration energy storage projects throughout the state to help commercialize and scale new technologies.

In addition, the CPUC has ordered the procurement of 2,000 MW of new long-duration energy storage projects and 2,000 MW of clean firm electric resources, such as geothermal, by 2028.

The CPUC has ordered the 40 electric retail sellers under its jurisdiction – electric investor-owned utilities (IOUs), community choice aggregators (CCAs), and energy service providers (ESPs) – to procure an unprecedented quantity of clean electric resources and the efforts are yielding results. However, project development complexities and market fragmentation among sellers have failed to result in significant

procurement of certain diverse resources – such as offshore wind, geothermal generation, and long-duration energy storage – needed to meet the state's clean and reliable portfolio. These electric resources often have lengthy development timelines due to the unique and complex permitting, interconnection, and construction requirements. In addition, these resources are typically the most expensive, more complicated, and larger than other electric resources that do not possess the same types of characteristics, attributes, and profiles needed for our future clean and reliable grid. While they provide electric resource diversity benefits in a model portfolio, such electric resources are not being procured because of the inherent development risks, timing uncertainties, and, in some cases, significant cost.

To address these challenges, a central procurement mechanism combining the buying power of customers could cost-effectively procure these types of resources, with the resulting benefits spread among all customers. Consideration of such a mechanism is critical for California to achieve 100 percent clean electricity. In addition, this procurement mechanism could be a key tool to develop offshore wind electric projects in federal waters off the California coast. California's Central and North Coasts present the state with a remarkable opportunity to develop thousands of megawatts of electric generation capacity and can generate power during key times of the day and year. Developing these projects will require new and expanded electric transmission infrastructure to bring the power generated to portions of the state with the most electricity demand.

Tracking Energy Development (TED) Task Force

The Tracking Energy Development (TED) Task Force, which is composed of the CPUC, CEC, California ISO, and the Governor's Office of Business and Economic Development (GO-Biz), was formed in response to the planned rotating power outages in 2020. It provides electric resource development assistance, as appropriate, for new electric generation and battery storage projects, with a priority on contracted projects needed for summer electric grid reliability.

TED Task Force members meet regularly to review project information, identify barriers, track supply chain issues and coordinate action across agencies. These efforts have helped many projects to stay on track in meeting the respective commercial operation dates.

The TED Task Force will continue to closely track and monitor the progress of high-priority projects expected to come on-line in the near term (2023–2025). Priority will go to:

- Electric generation and battery energy storage projects with executed power purchase agreements/contracts.
- Electric transmission lines and other infrastructure, including studies for electric generator and energy storage, that are identified as priorities by the TED Task Force or under agreement with other state, federal, or local agencies.



Implementing California's Clean Energy Transition

iii. Ensuring Electric Grid Reliability During Extreme Events

Climate change-driven extreme weather events such as heat waves, wildfires, drought and floods are creating unprecedented stress on the grid. At the same time, supply chain constraints and other factors have delayed new resources from coming on-line.

As California transitions to the electric grid of the future, climate change will continue to create more variable electricity demand and test the reliability of the entire system. California is taking action to bolster electric grid reliability in the near and midterm as it accelerates the deployment of clean electric infrastructure and enhances long-term planning.

To address these heightened reliability risks, the CEC, CPUC, and California ISO are updating and modifying their electric grid reliability requirements beyond traditional core planning and procurement assumptions. In addition, the state created the Strategic Reliability Reserve (SRR) to serve as an insurance policy against extreme weather events with programs overseen by the CEC and Department of Water Resources (DWR). The SRR provides supplemental electric resources beyond the additional electric resources being developed based upon updated planning and procurement requirements, such as an increase in the CPUC Resource Adequacy program Planning Reserve Margin and new inputs and assumptions in the CEC electricity demand forecasts.

In 2022, the SRR was composed of state-owned and -leased electric generation assets and power imports funded by the SRR to meet peak electricity demand during the summer months. Moving forward, DWR's SRR programs will strategically retain resources that would otherwise retire to avoid competing with electric retail sellers, providing a lower-cost solution and allowing the state to retain key electric resources until replacements are on-line and available.

The SRR also contains emergency demand response programs at the CEC that build upon emergency actions taken by the CPUC and the state in 2021. The CEC's Demand Side Grid Support program and CPUC's Emergency Load Reduction Program provide direct payments to customers who reduce their electricity use in the event of a grid emergency. Meanwhile, the CEC's Distributed Electricity Backup Assets Program funds the development of new distributed electric generators and incremental upgrades to existing generators that can provide additional output during extreme weather events.

With the investments to date, the SRR will continue to serve as a critical state-supported stopgap as California transitions, scales, and builds its electric grid of the future. New tools and investments, such as the SRR, are the exact types of creations California needs to smooth its progress toward successfully powering its economy with clean electric resources.

Implementing California's Clean Energy Transition

iv. Customer Electric Bill Affordability

The 100% clean electric grid of the future will power the entire economy including factories, businesses, cars, trucks, buses, home heating and cooling systems and more. Total customer energy costs will shift because more daily activities will be electrified. Instead of paying at the gasoline pump, Californians will pay their electric utility to fuel their vehicles. As more household appliances are electrified, customers can expect to use more electricity and less gas.

As the state continues to expand clean energy generation and storage projects, increase demand flexibility, and realize the potential of grid-integrated electric vehicles and buildings, the per-unit electric generation costs to customers will be lower. As California electrifies its economy, customers will benefit from economies of scale because the fixed costs of the grid will be spread over a greater number of per unit of sales as customers buy electricity for more uses.

Californians maintain moderate electric bills thanks to California's energy efficiency leadership and ability to manage demand. This includes building codes and standards that require minimum levels of efficiency for buildings and appliances which has spurred innovation and lowered costs for customers.

Electric Rates and Equity

Transition of California's electric grid and decarbonization of the economy require careful consideration of electric rates and ways that electric service costs are allocated among customers. Costs for all types of electric generation and grid modernization are paid primarily through electric bills. As lower-cost resources are procured and developed, everyone benefits through lower bills.

The CPUC's IRP process provides the path for least-cost, best-fit clean electric resources to serve California's electric needs. Likewise, publicly owned utilities are also building cost-effective portfolios of electric resources to serve their customers.

Aligning the costs of electric services with the prices charged to customers via rates and through bills is essential for equitably allocating these costs. AB 205 (Chapter 61, Statutes of 2022) requires the CPUC to establish an income-graduated fixed charge on the default residential electric rate tariff to cover the fixed costs of providing electric service in the electric IOUs territories by July 2024. This rate reform, coupled with the established time-of-use rate structure that covers the variable cost of electric generation, will reduce the per-unit price of power, help control rate volatility, support creation of better price signals that will enhance widespread electrification efforts, and have an embedded equity structure for the state's lower-income communities.

In addition to programs that support low-income households, California has provided electric rate and bill relief to the state's lower-income and disadvantaged communities who have been disproportionately impacted by the COVID-19 pandemic. Over the last two years, California distributed \$1.6 billion to address household energy debt that accrued as a result of the COVID-19 pandemic. These investments have provided utility debt relief to more than 3 million customers.



New Financing Models to Reduce the Upward Trajectory of Electric Rates

Last year, AB 205 expanded the scope and budget of the California Infrastructure Bank's (IBank) Climate Catalyst fund to include financing new electric transmission infrastructure that can access clean electric generation projects. Using the initial investment of \$200 million, California is exploring opportunities to leverage this funding with federal dollars. Realizing the potential to leverage federal financing for clean energy infrastructure is an important opportunity to support electric bill affordability as California builds out its clean electric grid.

New Technologies and Prioritizing Equitable Electric Bill Affordability

Technologies to advance decarbonization offer an opportunity to lower electric bills and implement the clean electricity transition in an equitable and inclusive way so those benefits are realized for all Californians, especially lower-income and underserved communities. The state is investing nearly \$1 billion to support building decarbonization with a prioritization on low- and moderate-income households, as well as disadvantaged communities. These technologies will also help customers access lower rates through demand flexibility by using power during times of the day when costs are the lowest.

Finally, the 2022-23 State Budget Act dedicated \$2.8 billion to new, clean energy technologies like offshore wind, long-duration energy storage, industrial decarbonization, and hydrogen and battery energy storage. These investments will support customer electric bill affordability by advancing the commercialization, and scaling the deployment, of promising technologies that will reduce the state's dependence on unsecure, volatile, and imported fossil natural gas for electric generation. This allocation includes leveraging federal funds to reduce costs to generate clean electricity and invest in the resilient electric grid of the future.

Creating Efficiencies Through Regional Grid Cooperation and Coordinated Operations

The California electric grid is part of a larger regional electric grid called the Western Interconnection. California electric utilities and the California ISO have strong electric transmission interconnections, regional coordinated planning, and operations with neighboring electric utilities and balancing authorities across the West.

Since 2014, the California ISO has administered a real-time wholesale electric power market that now includes about 80 percent of electricity demand in the Western United States. This Western Energy Imbalance Market (WEIM) has produced more than \$2.3 billion in cumulative cost savings for market participants, including more than \$1 billion in savings for California customers. These savings show the value of clean electric resource diversity and transmission connectivity across a wide geographical footprint.

The California ISO, western electric utilities, and stakeholders are now looking to build on the WEIM through the establishment of an Extended Day-Ahead Market (EDAM). EDAM could provide a deeper day-ahead optimization of resources across a wide geographic footprint and provide greater visibility and access to diverse resources. Enhanced regional coordination and market opportunities have the potential to play a key role in achieving California's goal of providing 100% clean electricity to customers cost-effectively and reliably.

Conclusion:

The Path Toward California's Clean Energy Future

California has set ambitious goals to build a future that requires more clean, safe, affordable, reliable energy. We have made tremendous progress toward moving away from dirtier sources of energy, but many challenges remain. The state will continue to move faster to build more clean energy generation and transmission capacity to modernize our electrical grid in the face of accelerating climate change.

Many of the ambitious goals we have set for ourselves have already been reached – some earlier than we expected. Building on that progress, California remains committed to leading the fight against climate change and will take the necessary actions to protect energy reliability during the clean energy transition.

Harnessing the innovation, drive, and tenacity our state is known for, California is well-positioned to build on our early successes and deliver clean, reliable, affordable energy for all Californians for generations to come.

