

California's 100 Percent Zero-Carbon Goal Hinges on Energy Storage

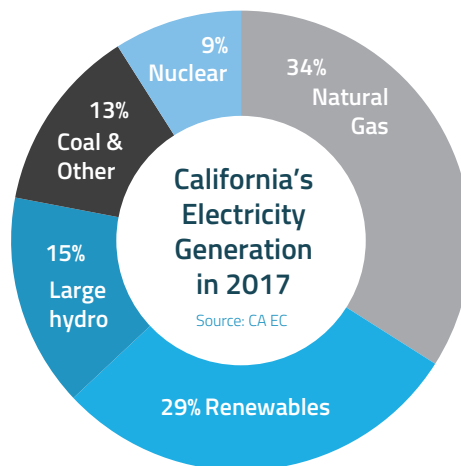
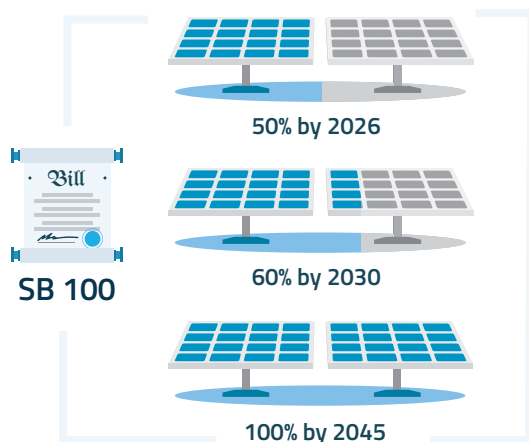
Building Standards, Investments in Electric Vehicle Infrastructure, and Market Reforms Among Key Policy Tools

Industry Insight

On September 10, California enacted legislation (SB 100) with a goal of procuring 100 percent of the state's electricity from renewable and zero-carbon resources by 2045. California's move is historic in that it represents the world's fifth-largest economy having established a renown in the international climate arena. The Golden State has accelerated the growth of its solar and wind industries but success likely depends on whether storage systems can supplant natural gas that provides about a third of the state's electricity. Earlier this year, California became the first U.S. state to mandate solar rooftop panels on new homes. To achieve its 2030 goal of five million zero emission vehicles, California recently enacted a law to assess charging infrastructure buildout. The new wave of clean energy and climate measures come as California wrangles the Trump administration's attempts to roll back the state's auto emission standards while also fighting record wildfires attributed to weather-related conditions.

California's Progress Towards Goals

California's Renewable Portfolio Standards (RPS) was first established in 2002 with the goal of 20 percent renewable energy by 2017. The goal was raised in 2006 (20 percent by 2010) and in 2008 (33 percent by 2020). Legislation enacted in 2015 set a target of 50 percent by 2030. California currently gets 24 percent of its electricity from hydropower and nuclear – which do not qualify for RPS – and 29 percent from renewables, almost triple the amount from 2007. The state's investor-owned utilities have remained on track to meet the requirements.



In 2013, the California Public Utilities Commission set a mandate for the investor-owned utilities to procure 1,325 MW of energy storage by 2020. Installations in the grid run by California Independent System Operator made up about 18 percent of existing U.S. large-scale battery storage power capacity last year, according to a May 21 report from the U.S. Energy Information Administration.

The growing need for flexible generation to smooth the variable output of renewables – combined with new building standards that mandate solar panels on new homes – will increase the dependence on storage. The law defines the goals, but does not detail the means of procurement, meaning there is leeway in how the state meets the requirement. Challenges stemming from the operational realities of a fully renewables-powered California could be averted with other zero-carbon possibilities.



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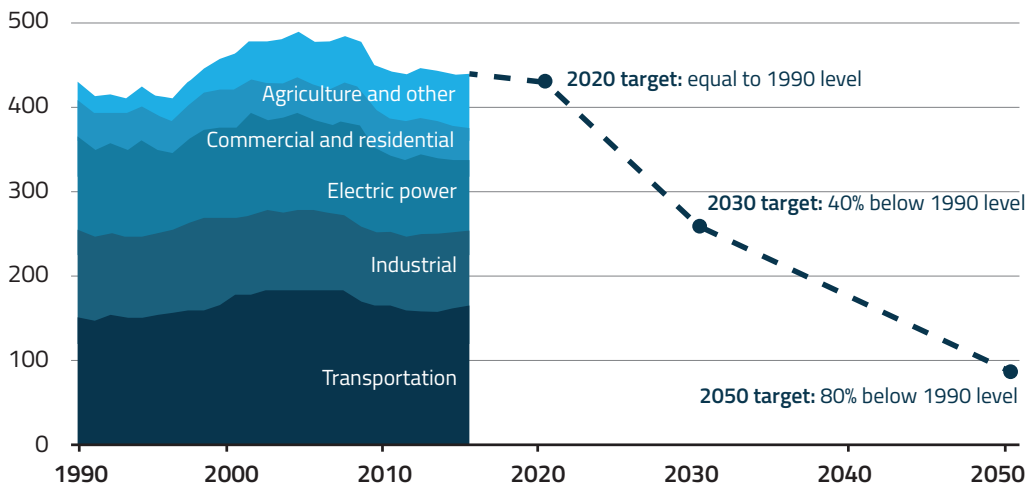
Emissions in California



In July, California Air Resources Board **announced** that **greenhouse gas emissions in California fell below 1990 levels for the first time since emissions peaked in 2004.**

Electricity generation had the largest decline among all the sectors with emissions dropping by 18 percent in 2016. Solar generation experienced a 33 percent growth while natural gas fell by more than 15 percent. **The board said that the price signal created by the emissions trading program rendered fossil fuel generation expensive, giving a boost to cleaner out-of-state power.** Hydroelectric power from outside the state grew by nearly 39 percent in 2016 thanks to heavy rainfall in the West Coast. The state has **a goal of curbing emissions by 40 percent by 2030 and 80 percent by 2050 relative to 1990 levels.**

California GHG emissions by sector and targets through 2050 (million tons CO₂ equivalent)

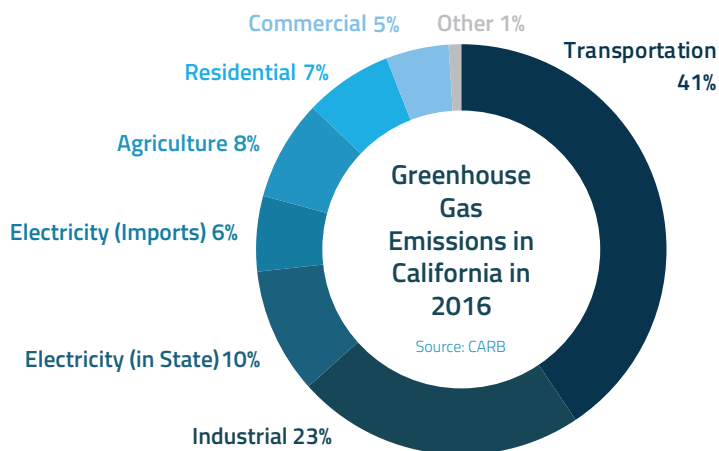


Source: EIA

Electric Vehicles and Path Forward



Zero-emission vehicles are critical to meet the state's goals **given that the transportation sector is the largest greenhouse gas emitting segment accounting for over 40 percent of California's emissions.** California's goal to have **five million zero-emission vehicles on the road ahead of the 2030 target date** will require the installation of over a **quarter-million chargers**, according to an Aug. 20 report by the California Energy Commission. At the end of 2017, nearly 14,000 public chargers, including, 1,500 fast chargers, served 350,000 plug-in electric vehicles.



Source: CARB

Recent Policies



California Enacts Law Banning Offshore Drilling in State Waters in a Counter to Trump's Expansion Plan

Sept. 8 - California Gov. Jerry Brown, a Democrat, **signed** legislation (**SB 834**) **banning the construction of pipelines and other oil and natural gas infrastructure within state waters**, hitting back against a proposal by the U.S. Interior Department to open more than 90 percent of the Outer Continental Shelf acreage to drilling. Gov. Brown also submitted the state's formal opposition to the agency's proposal to open new public land for drilling activities, saying that it contradicts the state's move to fight climate change and meet its objectives under the Paris climate accord.

California Grid Operator Board Clears Measures to Boost Energy Storage Role in Wholesale Markets

Sept. 5 - The California Independent System Operator Corporation board **approved** technical refinements that would **streamline the participation of energy storage and distributed energy resources in the wholesale market.** The measures include **enhanced bidding options** that would help better adapt to limitations of resources, such as demand response types that cannot respond instantly to real-time dispatch. Batteries would be allowed to absorb power when there is an oversupply and feed them back to the distribution system when needed. Interconnection improvements would provide connection options for new resources and allow for storage resources to continue to provide grid services.

Trade Group Seeks California Power Market Reforms as Growing Backstop Procurements Threaten Reliability

The Electric Power Supply Association **urged** the Federal Energy Regulatory Commission to find that the California Independent System Operator Corporation's resource **adequacy construct is fundamentally flawed** as it has forced the grid operator to rely on out-of-market mechanisms to obtain the capacity needed to maintain reliability and failed to support resource adequacy. The group sided with CXA La Paloma LLC which filed a complaint in June alleging that the "patchwork approach" has led to **insufficient revenues causing new and efficient generators to go bankrupt or exit the market.** The growing need for flexible generation to smooth the variable output of renewables – which will compound with new building standards that mandate solar panels on new homes – will increase the dependence on short-term out-of-market procurements. The association warned that failure to compensate independent generators will deter new entry, leading to higher prices for tighter supply and even shortages. To facilitate a durable market mechanism, the group asked the commission to order reforms to develop a three-year forward capacity market with mandatory auction participation and buyer-side mitigation rules. CXA La Paloma owns the 1,124-megawatt natural gas-fired La Paloma generating facility in California.

Recent Policies (Continued)



California Passes Legislation to Assess Charging Infrastructure Buildout to Achieve Five-Million EV Target

Aug. 27 - The California legislature **approved** a bill that would require the Energy Commission to **conduct a statewide assessment of electric vehicle charging needs to help meet the goal of putting five million zero-emission vehicles on the road by 2030**. The agency will explore all necessary infrastructure including make-ready equipment, offroad electrification, and all vehicle classes. The study, to be updated at least once every two years, would be prepared in coordination with the state utility commission and the Air Resources Board.

California-Quebec Carbon Auction Sells Out, Signaling Market Confidence After Ontario's Exit

Aug. 21 - The sixteenth quarterly carbon auction **held** by California and Quebec **sold all 79,421,265 carbon permits** offered for current emissions at \$15.05, above the floor price of \$14.53. The auction also **sold all of the more than 9.4 million permits offered for 2021 emissions at slightly above the floor price**. Ontario ended its carbon trading program in June after participating in two auctions since its linkage with California and Québec earlier this year. The first three-way auction held in February sold out a record 98.2 million permits for current emissions. The auctions are held under the cap and trade program which is a central part of California's plan to reduce greenhouse gas emissions 40 percent below 1990 levels by 2030.

California Grid Operator Unveils Rules to Expand Market for Energy Storage

Aug. 20 - The California Independent System Operator Corp. **proposed** amendments to **expand options for energy storage and customer-sited generation to earn revenue in wholesale power markets as the grid manager looks to break down barriers for the emerging technology**. The proposal would add three new evaluation methods for demand response, which is one of the most common ways for distributed resources, including energy storage, to participate in the wholesale markets. CAISO said that the two existing evaluation methods, one for pure load resources and another to include behind-the-meter generation, may be inadequate to capture the performance of various resources. The new methodologies, which compare historical demand to demand at the time of dispatch, are intended to improve accuracy, and reduce bias and variability for evaluating performance of the resources. The grid operator seeks a FERC approval for the changes to take effect Nov. 1.

California Seeks to Safeguard Vehicle Emission Standards From Trump's Rollback

Aug. 7 - The California Air Resources Board **announced** a proposal under which automakers seeking to sell cars in California after the 2020 model year would have to meet the state's stringent standards irrespective of the Trump administration's rollback of federal rules. Currently, cars complying with standards adopted by the U.S. Environmental Protection Agency for the model years 2012 through 2025 are deemed compliant with California's standards as federal regulations, at that time, would provide equivalent emission reductions. In its proposal, California clarified that the "deemed to comply" option would not apply if federal standards are weakened. On Aug. 2, EPA proposed retain the fuel economy standards from 2021 through 2026, rolling back a 2012 rule that called for increases to reach 46.7 miles per gallon target in 2025, and withdraw a 2013 waiver that permits California to impose more stringent emissions standards. **Twelve other states and the District of Columbia have embraced California's standards** and Colorado is in the process of adopting them. In May, eighteen states launched a legal challenge against EPA following its announcement to withdraw the Obama-era emission standards for cars and light trucks for model years 2022-2025. Comments are due on California's proposal by Sep. 24 and the board will discuss the plan during its Sep. 27-28 meeting.

California Opens Proceeding to Enhance Oversight of Renewable Portfolio Standards

July 2 - The California Public Utilities Commission **started** a new rulemaking to continue oversight of the state's renewable portfolio standards program. The commission will continue to review and monitor renewable procurement plans of retail sellers as well as procurements of investor-owned utilities, assess compliance, and take enforcement action. The new proceeding will consider improvements by adding new elements, and revising procurement methods and tariffs such as utility solicitation and renewable auction mechanisms.

California Authorizes \$738 Million to Expand Electric Vehicle Infrastructure

May 31 - The California Public Utilities Commission **approved \$738 million in electric vehicle infrastructure spending for Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company** as part of 2015 legislation that called for widespread transportation electrification in the state.

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