How giant batteries are making California's power grid stronger, and reducing the risk of blackouts during heat waves

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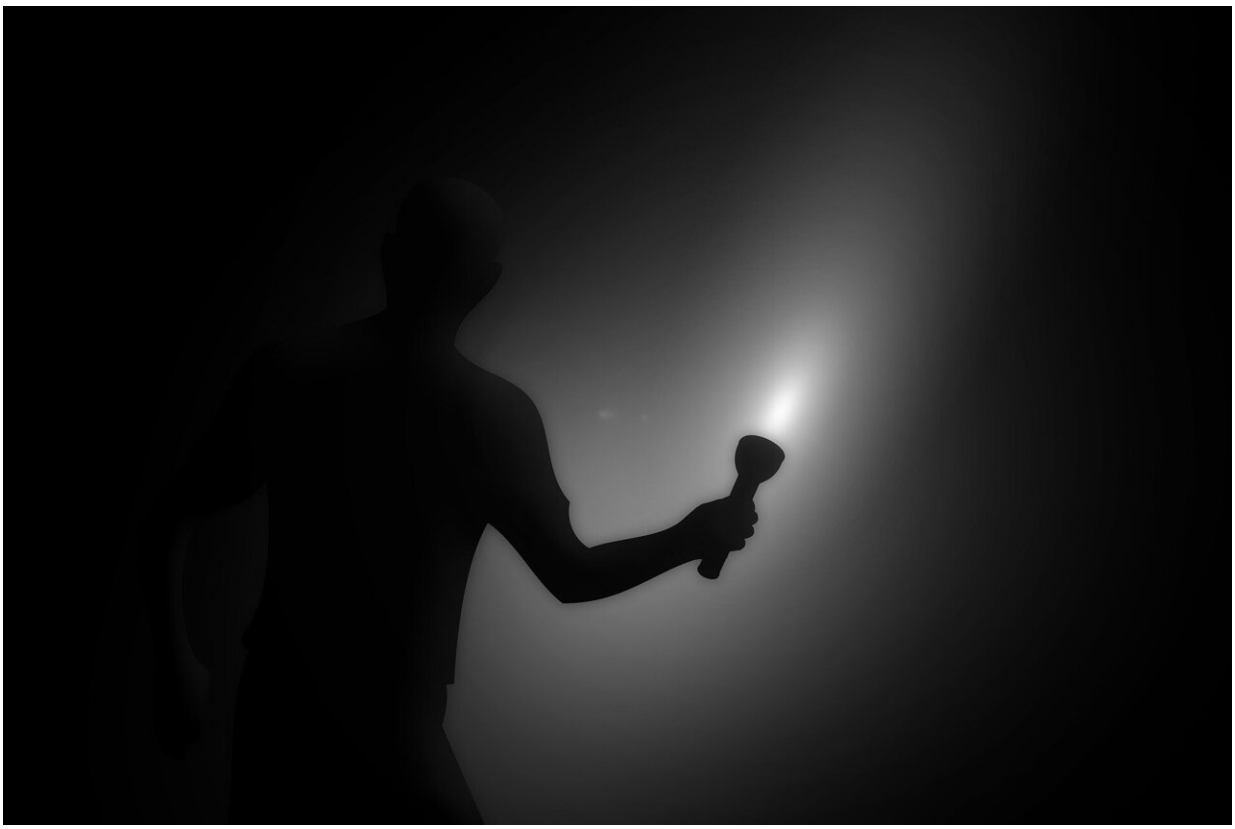

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Four years ago this week, California's power grid was so strained by a heat wave that rolling blackouts hit hundreds of thousands of residents

over two days. It nearly happened again two years ago, when state officials issued 11 "flex alerts" asking businesses and homeowners to voluntarily reduce electricity use to avoid power disruptions.

But this year when a record heat wave scorched the state over three weeks from mid-June to July—sending temperatures across the Bay Area and the Central Valley soaring over 110 degrees—there was plenty of power. No warnings. No shortages. No flex alerts.

A big part of the reason, experts say, is a boom in the construction of giant battery projects.

California's high-tech battery centers, built with thousands of lithium-ion batteries similar to the batteries in cell phones and electric cars, are solving the main shortcoming of the push for more renewable energy: the fact that the sun doesn't shine at night.

Battery storage has increased seven-fold in the past five years in California, from 1,474 megawatts in 2020 to 10,383 megawatts now. A megawatt is enough electricity to run 750 homes.

Before, when the sun went down every summer evening, giant solar farms stopped producing electricity, sometimes leading to power shortages statewide in the early evening. Now, the growing number of battery storage plants across the state can store that solar power during the day when it is plentiful.

The battery storage plants then release it back to the power grid in the evening as the sun goes down, but hot weather keeps electricity demand high because millions of Californians are running air conditioners.

"Think of it like an energy bank account," said Elliott Mainzer, president and CEO of California Independent System Operator, an agency in

Folsom that manages the state's power grid. "In the middle of the day, you are making big deposits. At the end of the day, we withdraw from that account."

Since 2020, companies in California have built more large-scale battery storage projects than any place in the world except China. Five years ago there were 36 such plants in the state. Today there are 175, with dozens more planned or under construction.

"It's definitely been a game changer in improving reliability," Mainzer said.

The shift has taken many people by surprise.

"These facilities are not sexy. They are not visible," said David Hochschild, chairman of the California Energy Commission. "They are out of view. The footprint is very small. They are out of sight, but not out of mind."

"They have been the difference maker," he added. "They are the reason we haven't had flex alerts. These storage facilities have provided an incredible cushion."

Many of the largest battery plants are in the Southern California desert, near Palm Springs, Blythe and Lancaster. But two of the biggest are in Monterey County, located on the site of the old PG&E Moss Landing Power Plant.

That natural gas-fired plant, built in 1950 and famous for its two 500-foot-tall concrete smokestacks, is now home to a 750-megawatt battery storage plant owned by Vistra, a Texas company, and a 182-megawatt plant owned by PG&E. They are two of the largest such plants in the world. Vistra says its plant is the world's largest.

The PG&E plant has 256 Tesla "Megapack" units. The gleaming white steel boxes, each about the size of a shipping container and weighing 56,000 pounds, were built at Tesla's Gigafactory near Reno. Arranged in neat rows and sitting on concrete pads, they are cooled by fans that hum in the background. The battery storage plant opened in 2022, and its storage provides enough electricity for 136,000 homes.

"This is a strategic location to connect to the grid," said PG&E spokesman Paul Doherty during a visit Thursday. "All of the wires and substations are here. And there's room to expand."

Tesla opened a new battery factory in Lathrop, south of Stockton, in 2022 that can produce about 13,000 Megapacks per year.

But the technology is not without controversy.

Fires broke out at the Vistra plant on Sept. 4, 2021, and Feb 14, 2022. Investigations showed that they were caused by a malfunction in a fire sprinkler system, which released water and caused several of the units to overheat.

Then in September 2022, a fire broke out at the PG&E Elkhorn battery plant. Police closed Highway 1 for 12 hours. An investigation found it was caused by an improperly installed vent shield on one of the 256 units, which allowed rainwater to get in and short out the batteries. There were no injuries to firefighters, PG&E employees or the public.

Afterward, Gov. Gavin Newsom signed a law requiring battery storage plants in California to draw up emergency response plans with local fire departments and increase fire safety.

"Increasing the state's battery storage is essential to reaching our clean energy goals," said State Sen. John Laird, D-Santa Cruz, who wrote the

bill. "But we also have to ensure that these facilities have safety systems in place to protect the health and well-being of workers and surrounding communities."

Last month, after two fires occurred at San Diego County battery storage facilities, San Diego County supervisors required county officials to draw up tighter rules that would restrict battery storage plants near homes, schools and other facilities. And when Vistra proposed building a large battery plant in Morro Bay, citizens there put a measure on the November ballot on whether to allow it.

Such fires are rare, said Mark Jacobson, a professor of environmental engineering at Stanford University. And by helping the state's renewable energy to keep growing, they are reducing the amount of electricity generated from natural gas, which in turn reduces soot and smog.

"There are 12,000 people a year in California who die from air pollution," Jacobson said. "Nothing is perfect, but if we want energy, this is the best way to do it."

In an effort to reduce greenhouse gas emissions and air pollution, California political leaders have increasingly mandated that big utilities like PG&E, Southern California Edison and San Diego Gas & Electric produce more and more of their electricity from renewable energy.

In 2018, former Gov. Jerry Brown signed a law requiring that 100% of the state's electricity come from carbon-free power like solar, wind, geothermal, hydroelectric and nuclear by 2045. Today the state is at 61%.

To make renewable energy more reliable, state regulators have required utilities to build battery storage or sign contracts with companies for it. Now the utilities are making money by buying power at cheap prices in

the middle of the day when it is plentiful and selling it at a higher price in the early evening.

On some days this year, battery power has become the largest source of electricity on California's power grid. On Wednesday, a record 8,320 megawatts of battery power was on the grid at 7:35 p.m., the equivalent of 16 natural-gas-fired power plants running full power, or four nuclear power plants the size of Diablo Canyon running at peak capacity.

"It's happened so fast," Jacobson, the Stanford professor, said. "Only a couple of years ago nobody was talking about batteries on the grid. California really demonstrated for the first time how beneficial they can be."

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