

## Microgrids' an energy alternative in the face of increasing outages

Public service agencies have their own power systems

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These solar power panels at the Yolo County Sheriff's Office are one reason such public safety facilities are able to maintain power even when power is cut by PG&E or other utilities. DAILY DEMOCRAT ARCHIVES

Even when the electrical grid falters, fire stations remain a sturdy lifeline to surrounding homes, schools and businesses.

The doors open in an emergency, so that the fire trucks can get out and save lives. Metal gates open and close. Fremont's 911 system, linking tens of thousands of residents to first responders, is protected.

That's true Woodland, Davis and elsewhere across California. Self-sufficient, such emergency public services don't need PG&E or any power provider. It's protection against a future of more planned outages in an ever hotter and drier California.

It's also why Cache Creek Casino was able to stay open in the Capay Valley.

And why the Yolo County jail had the lights shining, and electrically operated doors secured.

The casino and emergency agencies like fire, and police departments, have their own independent power systems. Some of these are generators. But for others it's a solar-based "microgrid" that collects, stores and releases energy on demand, operating even when PG&E and power utilities don't.

Last week's blackouts not only incited fury but exposed the peril of relying on PG&E's antiquated power grid — and the promise, aided by the falling cost of technologies, of independent infrastructures that can better withstand disasters, both natural and man-made.

The projects are new and isolated, but their implications are

far-reaching, upending the traditional relationship between consumers and utilities.

PG&E's major power arteries sprawl across 2,500 miles. A forecast of high winds and low humidity led PG&E last week to shut down nearly 100 high voltage transmission lines, which are linked to about 25,000 miles of smaller distribution lines. That cut off power to about 730,000 customers in 34 California counties.

"Here we are in California — with digital technologies, digital economies — and PG&E is running the grid like we're living in a developing country," said Peter Asmus, a microgrid expert at Navigant Research, a market research and advisory firm. "The grid is not reliable.

"The number one technologic solution is to have microgrids," he said.

On good days, microgrids work in tandem with PG&E's supply. But in a crisis, they can function on their own.

When PG&E cut power to the Santa Cruz Mountains last week, Graham Hine's lamps flickered. He heard a beep from his computer's surge protector.

But then his Tesla Powerwall batteries — charged by solar panels — fired up. He stopped charging his car, instead devoting the batteries to his refrigerator, freezer, television, computer, two water heaters, WiFi, clocks, smoke alarms and other appliances.

"I turned off a few extra lights, kept watching TV for another hour, then went to bed," he said. By morning, the batteries still held an 80% charge. Then the sun came out, and they refilled.

Until recently, diesel generators have been the only tool to prevent interruption of service. The machines are still useful, but they're dirty, emitting carbon. They require fuel to keep running — and in a crisis, fuel may be in short supply.

"They're the backup of the backup," said Vipul Gore, president and CEO of Gridscape Solutions, which owns and operates Fremont's microgrids.

The Fremont project is one of several research efforts supported in part by a grant from the California Energy Commission, which seeks commercialization of the technology for the mass market.

Its solar panels, sitting atop a car shelter, soak up photons. Their energy is stored in a tall refrigerator-sized tower — a lithium-ion battery — secured to a concrete pad and air-

conditioned to stay cool. Next to it stands an inverter, to convert DC to AC power.

Most critical is a small box holding a computer called a controller — "the brains of the system," said Gore — that can detect an outage and suddenly kick the system into action. About 45 kilowatts, equivalent to four or five homes, powers the whole station.

The system regularly relies on the solar system and battery as much as possible, to curb its PG&E usage, said DiFranco. And each system sits, discreetly, in a narrow strip of space behind the fire stations.

"It is great. It seems to be working well, giving us a longer run period in the event of power outage," said Station 11 battalion chief Will Krings.

In addition to Kaiser Permanente's Richmond Medical Center, microgrids are helping power Napa's Alpha Omega Winery, Sonoma's Stone Edge Farm, the Thatcher School in Ojai and the U.S. Marine Corps' Camp Pendleton in Southern California.

Apple Park, the company's new headquarters in Cupertino, is powered by a 17-megawatt onsite rooftop solar installation and four megawatts of biogas fuel cells — all controlled by a microgrid with battery storage.

But microgrids aren't cheap. And they require regulatory approval from cities and an "interconnection permit" from PG&E, with a multi-step review of the design, engineering and other aspects of the project, Gore said.

As the costs of batteries and solar panels drop, so does the cost of microgrids. At Fremont's first fire station, built in 2017, the grid cost \$800,000; at the second and third stations, built in 2018, the cost was \$500,000 each. New systems now cost about \$300,000, Gore said. With federal and state tax credits, the cost of a grid can nearly rival the cost of a large diesel generator. There is the additional benefit of lowered utility bills, because energy is generated.

The investment was essential to allow independence from future outages, said Fremont's DiFranco.

"This was not a one-time event. It will be ongoing and will only get worse," the sustainability manager said. "There is opportunity now to plan how — with this different energy system design — we can be much more responsible and resilient communities."