

# The Geysers at 50

*Small power plant evolves into world's largest geothermal energy complex, with times of boom and bust along the way*

**Steve Hart, Santa Rosa Press Democrat, 10-3-10**

When engineers flipped a switch at Pacific Gas & Electric Co.'s Unit 1 at The Geysers on Sept. 25, 1960, it marked the beginning of an industry.

The small power plant on Big Sulphur Creek in northeast Sonoma County tapped super-hot, high-pressure steam from deep below the Earth's surface. Driving a turbine inside Unit 1, it generated the first commercial geothermal power in the U.S.

Fifty years later, The Geysers is the world's largest geothermal energy complex, with 18 modern power plants producing 850 megawatts of electricity, nearly one-fourth of California's green energy supply.

It's enough to power 850,000 homes.

The Geysers' evolution hasn't been smooth. There were periods of boom and bust, with furious expansion followed by plant shutdowns and bankruptcies.

Twenty years ago, scientists predicted The Geysers would run out of steam, exhausted by too much development. The geothermal boom also caused environmental damage, including air, water and noise pollution.

Today, the complex is on firmer footing, with technology helping assure its future. "We've learned a huge amount about how to better utilize the resource," said Mike Rogers, geothermal manager for Calpine Corp., the area's largest operator. "The Geysers is going to be around for another 50 years."

Most -- but not all -- of the industry's environmental problems have been solved, said Jeff Gospe of the Anderson Springs Community Alliance, which represents a historic resort community near The Geysers in Lake County.

"The geothermal industry is a much better neighbor than they were 30 years ago," he said.

Calpine is investing \$200 million at The Geysers, drilling new wells, rebuilding turbines and expanding its pipeline network.

Calpine also is testing a dormant part of the steamfield, hoping to develop enough steam to run two new power plants and generate nearly 100 additional megawatts.

"It's a hot area of the steamfield. We know there's a resource there," Rogers said. "So far, it's in line with our estimates. We're finding heat and some steam."

At The Geysers, underground rocks are naturally heated by a magma formation that has split the Earth's crust about four miles below ground. When seeping water hits the super-hot rocks, it turns to steam and shoots back to the surface.

Calpine plans to create more steam by injecting water into The Geysers' underground heat reservoir.

Water has brought new life to the 45-square-mile geothermal complex in Sonoma and Lake counties. In 1997, operators began injecting recycled water from Lake County to replace some of the steam that had boiled away.

Six years later, Santa Rosa started piping millions of gallons of reclaimed wastewater each day to The Geysers, in a major expansion of the recharge project.

It has slowed the decline in steam pressure, Rogers said. "The wastewater injection project has been a success story. It's a great way for municipalities to deal with their wastewater, and it has given us a much steadier production profile."

So far, 50 injection wells have been drilled. Calpine has about 330 steam wells.

But water injection has had a negative side effect, Gospe said, causing frequent small earthquakes that damage homes in Anderson Springs and other communities near The Geysers.

"We get surprisingly large ground motion" from the shallow quakes, Gospe said. Scientists agree that geothermal production triggers small earthquakes, but they say it's unlikely to cause larger ones.

The industry now pays \$100,000 a year to Anderson Springs residents to fix cracks, repair broken windows and retrofit their homes.

Meanwhile, the industry has stopped polluting local creeks with drilling waste and cleaned up its plant emissions, Gospe said.

Geothermal operators also are using more efficient turbines and improved pipeline technology to maximize production, Rogers said. They're drilling deeper -- down 13,000 feet -- to reach untapped steam reserves.

California explorer William Elliott stumbled on The Geysers in 1847 while hunting for grizzly bears in the Mayacamas Mountains. He compared its bubbling hot springs and spectacular steam vents to "the gates of Hell."

Years later, visitors rode stagecoaches to resorts at The Geysers to see the steamy white fumaroles and bathe in mineral pools.

In the 1950s, entrepreneurs from the oil and gas industry started drilling test wells at The Geysers and negotiated a deal with PG&E to build the first commercial steam-powered generating plant.

Unit 1, located 500 yards east of the old Geysers resort, generated just 11 megawatts. It was demolished in 1992 and the site now is marked by a plaque.

PG&E built more plants, and others joined the hunt for steam at The Geysers after the 1970s Arab oil embargo sent energy prices soaring. By 1987, there were 26 power plants generating 2,000 megawatts.

But that level of production quickly proved unsustainable. Pressure dropped sharply as new wells started to draw steam from the old ones.

By 1995, production had declined to about 1,000 megawatts.

Meanwhile, the industry was hit by falling energy prices. Wells were abandoned, plants started closing, and work stopped on projects under construction.

In 1999, Calpine bought PG&E's holdings at The Geysers, acquiring most of the geothermal complex. The Houston-based company operates 15 plants and produces about 725 megawatts.

Last year, Calpine reached a deal to sell more geothermal power to PG&E, which is trying to increase the amount of energy it gets from renewable sources.

Northern California Power Agency, a consortium of municipal utilities including Healdsburg and Ukiah, operates two 55-megawatt geothermal power plants and about 65 steam wells in the southeast corner of The Geysers.

A third operator, U.S. Renewables Group, has reopened the 55-megawatt Bottle Rock power plant in Lake County.

There should be reliable production from The Geysers for the next 50 years, Rogers said. "Getting water back in the ground to recharge the reservoir and using steam more efficiently is the key," he said.