

Calpine testing injection technology; the 50-year plan

Gary Quackenbush, North Coast Business Journal, 3-19-12

SONOMA COUNTY – Key projects are under way at The Geysers to upgrade existing facilities, test new Enhanced Geothermal System technology and to study the effectiveness of injecting treated wastewater to fracture ultra-hot rock and stimulate greater steam production.

Progress also continues toward the potential addition of two new geothermal power plants.

“Our objective is to sustain current levels of steam and electricity output by responsibly managing the geothermal resource while also planning for the next half century using leading-edge technology,” said Mike Rogers, Senior Vice President, Geothermal Region with Calpine Corporation (NYSE:CPN).

Calpine’s geothermal operations encompass a 29,000-acre, 45-square mile area 75 miles north of San Francisco in portions of Sonoma and Lake counties.

Today, 15 steam-driven power plants produce 725 megawatts (MW) of clean energy representing 20 percent of California’s renewable electricity generation.

Two proposed new plants

The Sonoma County Permit and Resource Management Department determined that the two proposed power plants would have no significant effect on the environment and identified the Mitigated Negative Declaration (MND) process as the appropriate permitting path for these facilities.

Last November, the Sonoma County Board of Supervisors unanimously approved land use permits, based on the MND declaration, paving the way for the construction of two new geothermal power plants with capacity to produce up to 49 MW of electricity each. These would be the first new plants to be constructed at The Geysers since 1989.

Before construction could begin, the Northern Sonoma Air Pollution Control District’s air permit process must be completed and Calpine must secure a contract to sell power the plants would produce.

Groundbreaking for the first plant could take place this year, although utilities still need time to review their renewable energy plans and to assess the delivery timeframe and cost of power from these plants. Depending on who purchases the power, a Power Purchase Agreement (PPA) could also require regulatory approval.

The “Wildhorse” plant would be the first to be built, followed by the “Buckeye” plant a few years later.

The 50-year plan

Calpine will be working over the next several years to upgrade existing power plants and the steam field extraction process to ensure ongoing production over the next 50 years. Improvements include updating and standardizing control systems to enhance productivity and automate operations.

All but two of the steam turbines originally installed in 1982 will be replaced with more efficient units from the

Toshiba Corporation that generate more megawatts using less steam.

Vacuum pumps will also replace steam driven systems, and more injection and production wells and pipelines will be added to help maintain consistent electricity output of six MW hours per year – a rate that has been sustained for over a decade.

With continuous use, The Geysers' 333 steam wells and 45 injection wells, linked to power plants by an 80-mile network of pipes and 69 miles of injection water lines, has resulted in a decline in overall steam pressure.

“We are examining alternative techniques, such as using high efficiency turbines that use less steam,” Mr. Rogers said. “But our options do not end here.”

Enhanced geothermal system

In a collaborative program with the U.S. Department of Energy, Lawrence Berkeley National Labs and the U.S. Geological Survey, Calpine has drilled two experimental wells as part of an Enhanced Geothermal System demonstration project at The Geysers.

“This project involves injecting low volumes (200 to 800 gallons per minute) of reclaimed water at ambient temperatures into deepened wells, Prati State 31 and Prati 32, drilled over a hot underground dome in our Northwest Geysers steam field where temperatures reach 750°F,” Mr. Rogers said. “We want to see if this technique will stimulate wells to produce more steam.”

The intent is to determine how water injection affects the fracturing of hard rock with low permeability – where relatively few fractures and little steam exists – compared to the steam reservoir that feeds existing power plants.

Calpine estimates that this project will produce enough electricity to power a city of 6,000 people.

“We started injecting these wells in October 2011 and observed a quick response in surrounding well head pressures up to 2,000 feet away resulting in an increase of 40 percent in well steam flow. This increase accelerated through January until pressures stabilized. The next step is to conduct flow testing in existing steam and injection wells.”

Six million dollars of the cost of the project was paid by the U.S. Department of Energy with an additional \$5 million from Calpine.

“During this project – as is the case throughout the entire Geysers field – care is taken to monitor associated micro-earthquake activity that may be produced to determine the relationship between injection rate variations and microseismic activity,” Mr. Rogers said.

The next step is to vary injection rates and find optimum levels, as well as to assess the impact on neighboring wells.

“If this project is successful, it will make an excellent case study for other geothermal sites in the U.S. and around the globe looking for ways to extend the useful life and stimulate higher steam pressures from their legacy generating facilities.”

For more information about The Geysers and free tour opportunities, visit www.geysers.com or call 1-866-

GEYSERS. The Visitor Center, located at 15500 Central Park Road in Middletown, CA 95461, is open from 10a.m.- 4p.m., Wednesday to Saturday.