

## Company says proposed geothermal project holds promise for renewables

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This is the second installment of a two-part article on a new geothermal project in The Geysers.

THE GEYSERS &ndash; A new geothermal technology is being rolled out in The Geysers, an area that for decades has been a center of clean energy production.

The Geysers is the largest geothermal production area in the United States. For that reason, it attracted the venture capital company AltaRock Energy, with offices in Sausalito and Seattle, which is beginning a two-year demonstration project to prove the effectiveness of engineered geothermal system (EGS) technology.

The technology requires drilling down thousands of feet deep into the earth's bedrock, fracturing it and injecting water into the fractures in order to harness the resulting steam for geothermal energy production.

AltaRock has a \$6 million federal Department of Energy grant along with \$30 million in private investment capital to back it.

Its chief executive officer, Don O'Shei, and senior vice president, Jim Turner, say EGS technology offers the opportunity to expand geothermal production to areas around the western United States that haven't previously been geothermal producing areas.

But it's a technology that has resulted in earthquakes in some parts of the world where it's been tested, most notably Basel, Switzerland, where thousands of quakes were triggered, as Lake County News has reported.

In Anderson Springs, the closest community in the county to geothermal production, AltaRock's plans have raised concerns because residents there already deal with earthquakes due to the operations of Calpine and the Northern California Power Agency.

Anderson Springs Community Alliance President Jeff Gospe also said the public process had little noticing for the community and the project's environmental assessment initially didn't include years of seismic data.

The assessment has since been amended to include some of that data, but the document also stated that the information didn't lead to a conclusion other than to let the project move forward, because increased earthquakes aren't expected.

Understanding seismicity and The Geysers

David Oppenheimer, a seismologist with the US Geological Survey, explained that The Geysers is ringed by two faults, the Callayomi to the northeast and the Big Sulfur Creek fault.

Oppenheimer said geologists can see faults expressed at the earth's surface based on the different kinds of rock present, like granite and sandstone.

Neither of those faults, Oppenheimer explained, are mapped as active faults, but that's not to say they couldn't produce earthquakes.

But he said that, to get a big earthquake, you need a big fault.

He estimated the Callayomi could produce a quake as big as 6.0 in magnitude, while the Big Sulfur Creek's maximum quake potential likely is about 5.0. That's compared to a major fault like the San Andreas, which could produce up to an 8.0-magnitude quake.

There's also no danger of The Geysers faults triggering the San Andreas fault, said Oppenheimer.

Faults, he added, are unpredictable. The Loma Prieta fault that caused a devastating earthquake in the Bay Area in 1989 may not produce another earthquake for 1,000 years.

Oppenheimer explained that, over the last 35 years, the largest quakes recorded in The Geysers measured 4.5 in magnitude. This past January, a 4.2-magnitude quake was reported in The Geysers, as Lake County News has reported.

Basel, which had a 3.4-magnitude quake resulting from its drilling project, suffered from a public relations problem in that they didn't properly prepare the public, said Oppenheimer.

While the project's documents haven't stated a specific magnitude when it comes to resulting earthquakes that could shut down the project, Oppenheimer said AltaRock will have to back off of its project if they begin getting quakes over 2.0 in magnitude.

Explaining how the steamfield works, Oppenheimer noted, &ldquo;All of the (earthquake) activity that you see up there is induced,&rdquo; which occurs when you start drilling and injecting water into the many small fractures in the underlying rock.

The fact that industry is responsible for the activity also has been acknowledged by Calpine.

&ldquo;If everything goes according to plan, there is no big fracture they're going to intersect in their target area,&rdquo; said Oppenheimer.

The dirt on the surface of the earth extends only a few feet. Drillers hit rock very quickly, said Oppenheimer.

Most of the existing geothermal production takes place in sandstone &ndash; also called graywacke &ndash; which has shale in it, said Oppenheimer.

Underneath that, there's a layer of felsite, an intrusion of molten hot magma from about one million years ago, he said.

That rock &ndash; still cooling after a million years &ndash; is the heat source for the water in the graywacke. Stresses from the shifting tectonic plates create fractures in the felsite, allowing the steam to escape.

AltaRock officials said they plan to drill in an area of The Geysers where major fault lines aren't located. O'Shei said they will be drilling and fracturing undifferentiated rock that won't rise to the pressure built up in the Basel project. They'll

also have real-time monitoring systems that Basel didn't have.

"Obviously, we thought about this a lot," said O'Shei.

Turner said construction for the drilling will be completed this year, and monitoring and testing will take place during 2010. "We want to demonstrate this is a viable technology."

But expanding geothermal production in the already volatile Geysers area "really raises concerns," said Gospe.

Around 2001, when Gospe became actively involved in tracking the area's earthquakes, seismic activity began to rise dramatically, at about the time Santa Rosa joined the Geysers injection pipeline, he said. Geothermal injection in Lake County started in 1997.

"We're seeing larger earthquakes," said Gospe, with a growth in quakes measuring 4.0 and above, with each year averaging about two such quakes. A 4.0 quake has 30 times the energy of a 3.0 quake, he added.

In 2008, Anderson Springs experienced 85 quakes measuring 2.0 or above within three miles of the community, up from about 49 the previous year. Through May 28, they've recorded 67 such quakes.

And while those quakes don't appear large, Gospe said they're seeing that 86 percent of the smaller quakes — measuring in the magnitude range of 1 and 2 — actually are causing more damage and being more widely felt. That flies in the face of traditional assumptions about earthquake monitoring, which tends to ignore quakes if they don't have a magnitude of 3.0 or above, he said.

Rather than looking at the quakes solely based on the Richter scale, Gospe said it's important to consider the Modified Mercalli Intensity Scale, tracked by the US Geological Survey, which looks at quake intensity.

"The concern is you're taking a very seismically active area and introducing something new," he said. "You hope they know what they're doing."

Company becomes involved in the community

Joan Clay, a member of the Anderson Springs Geothermal Impact Mitigation Committee, confirmed that AltaRock officials have been sitting in on the group's meetings.

She said NCPA gives \$30,000 to the community annually for seismic mitigation. AltaRock, she said, has tacked on another \$10,000 and committed another \$10,000 to the community's planned sewer project.

Clay credited AltaRock with doing more about mitigation than Calpine for the Anderson Springs community — the nearest community to The Geysers operations — which she said doesn't receive any money or royalties from local geothermal production.

Mark Dellinger, administrator for Lake County Special Districts, said AltaRock is showing corporate responsibility and leadership in dealing with the mitigation issues, pointing to their willingness to make monetary contributions.

The company has asked to be formally added as a member of the Anderson Springs Geothermal Impact Mitigation Committee, which will go before the Board of Supervisors for approval on July 7.

"I don't think that they'd want to be on that committee to say no to mitigation," said Dellinger.

Later this summer, the board also will consider AltaRock's request to be added to the Seismic Monitoring Advisory Committee, Dellinger said.

"I think they're doing anything that we would have asked any other developer to do," Dellinger said.

District 1 Supervisor Jim Comstock said he first heard of the project in December and began attending some of the community meetings, including the April Middletown information meeting.

"Who knows if this is going to work or not," said Comstock, adding that he doesn't know if the county will take a position on the EGS project or not.

Growing interest in renewables

O'Shei said the drilling technology could assist with creating more renewable electricity. That doesn't do much to cut into foreign oil usage, he said. "What it does help you do is not burn coal."

Given the current state of the US energy market, true carbon sequestration in coal is many years out, O'Shei said. However, the demand for power is rising significantly, and wind and solar can help meet some of that need.

A utility needs to be able to produce power around the clock, and geothermal and EGS would offer baseload power and complement wind and solar, O'Shei said.

O'Shei and Turner explained that they raised equity investments in two rounds — the first took in \$4 million, the second \$26 million, plus they received a \$6 million grant from the Department of Energy.

AltaRock's plans drew investors such as Google, Khosla Ventures, Advanced Technology Ventures, Vulcan Capital and Kleiner Perkins Caufield & Byers, a company actively searching out green technology investment opportunities. Its partners include former Vice President Al Gore, with former Secretary of State Colin Powell listed among its strategic limited partners, according to the company's Web site.

AltaRock also has gained the ear of officials in Congress.

In September 2008, Rep. Jay Inslee (D-Washington) mentioned AltaRock Energy in comments on the House floor about a comprehensive energy bill.

Discussing the company's EGS techniques, Inslee said, "AltaRock Energy is going to be ready to commercialize this technology, we hope, in the next several years that could produce potentially half of our electrical needs in the United States if we can surmount a couple of technological challenges involving pumps. Here is a company that could be a total game changer, and it needs policies from Congress to move forward. Our proposal, the Democratic leadership will propose, will support that technology."

Last September, the company also finalized a deal with Weyerhaeuser Co. and Weyerhaeuser Company Foundation to use explore the use of EGS on 667,000 acres in California, Oregon and Washington — of which 25,400 acres are in Northern California.

AltaRock reported that Weyerhaeuser granted it an exclusive option by Weyerhaeuser to assess the geothermal potential and convert up to 40 percent of the acreage rights to geothermal development leases within two years.

Anderson Springs resident Meriel Medrano said she and her neighbors will be watching what happens in the coming months, and are awaiting the installation of a promised new strong ground motion monitor in Anderson Springs, which will augment another one already located there.

While the local geothermal operators have worked to move their injection operations away from residents, she said the geothermal industry, from the very beginning, hasn't known what would happen in the area, where impacts usually were underestimated.

Gospe said there should be some effort made to offer economic incentives for people living close to the operations, as is done in other places, such as Iceland.

But a greater concern is what will happen if something goes wrong and 4- and 5-magnitude quakes result, said Gospe.

Private companies, he said, tend to declare bankruptcy and walk away when things don't go right. "We want to make sure they'll make the community whole" in the event something goes wrong, said Gospe.

The bottom line, he said, is that the community wants the company to take responsibility, operate properly, and mitigate or compensate when things don't go right.

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New geothermal project raises questions, concerns

Read the first part of this report here: