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Small town fears quakes from geothermal energy project

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Published Monday, Jul. 13, 2009

ANDERSON SPRINGS – Residents in this tiny Lake County community have complained for years about the earthquakes touched off by the geothermal energy projects that tap the vast reservoir of steam in the mountains behind their homes.

Now, with the federal government, Google and some of Silicon Valley's top venture capital firms committing millions to test a new way to mine clean energy from the earth here, the locals are finally getting some attention.

On a ridgetop above Anderson Springs, Bay Area startup AltaRock Energy Inc. is drilling a hole more than 2 miles deep. As soon as August, the company plans to inject high-pressure water to crack the solid, 500-degree Fahrenheit bedrock, creating an artificial reservoir of superheated water. The steam will then be used to drive electrical turbines.

If the test works, it could pave the way for essentially limitless exploitation of the heat energy in Earth's crust.

Today, geothermal power is generated by tapping natural veins of steam, which are rare. Anderson Springs sits on the shoulder of the world's largest tapped geothermal site, one of only two major sites in the nation.

The technique AltaRock is piloting would make it possible to develop geothermal power anywhere there's hot, solid rock within a few miles of Earth's surface. Such sites are common, meaning that the new technology would open up a power source big enough, in theory, to meet the nation's entire energy demand thousands of times over – all without producing the greenhouse gases that contribute to global warming.

In Anderson Springs, though, the project has homeowners worried that the regular quake activity they already contend with would get even worse. Over the past two decades, the region has experienced between 13 and 32 earthquakes each year greater than magnitude 3.0 – including six in the past two weeks – according to U.S. Geological Service data, as well as thousands of smaller quakes.

While these are relatively small quakes, they originate near the surface and can feel stronger

than the numbers suggest.

There's little debate that the quakes are caused by the existing geothermal projects, as water is injected and withdrawn, causing rock to shift.

AltaRock says its test shouldn't trigger any quakes larger than magnitude 2.3, and that it has reliable ways to calm any stronger shaking.

Government and academic seismologists say the site is a good place for the trial because, after years of geothermal prospecting, the geology of the area is very well understood and the chances of inadvertently setting off movement on a large fault are remote.

Still, residents are looking for more assurances that the project won't exacerbate local seismic activity, and that if it does, the company will fix things. For starters, they'd like AltaRock to carry more than the \$5 million in insurance that federal permitting agencies require.

"We're not against geothermal; we just want things done right," said Anderson Springs resident Meriel Medrano, who has tussled with geothermal developers since the 1970s, when drill mud fouled the community's water supply.

After years of agitation by Medrano and others, existing power plant owners in the past few years have begun to compensate Anderson Springs and the nearby community of Cobb. Roseville-based Northern California Power Agency contributes up to \$30,000 annually to cover repairs. Energy giant Calpine pays \$35,000 a year for community improvements at Anderson Springs, recently including a new foosball table and renovations to a wading pool at the local recreation center.

AltaRock has pledged to contribute \$10,000 this year to the community mitigation fund. The company also is buying the town a \$20,000 piece of equipment to monitor quakes.

Anderson Springs was founded in 1873 as a hot springs resort. Its 190 houses and cabins are still mainly getaways, with only about one-third occupied year-round.

Many families have handed down cabins through generations, making for a rich oral history of local seismic activity – which, by everyone's account, is stronger than it used to be.

"When I was a kid, we never felt earthquakes," said 44-year old Jim O'Brien, a Levi Strauss & Co. sales manager from Vallejo, taking a break from the bocce court one afternoon last week.

While the geothermal checks have spruced up the rec center, some Anderson Springs locals are looking for operators of the power plants – which produce electricity worth hundreds of millions of dollars a year – to cover bigger-ticket items. These include a \$4 million project to connect the community to a nearby wastewater treatment plant.

"For the amount of money that's made up there, we think they should be begging to pay for that sewer," said Joan Clay, an Anderson Springs resident who sits on local committees that allocate the compensation funds.

Recent national publicity may increase the homeowners' leverage.

A front-page story in the New York Times last month raised questions about the risks of cracking deep bedrock, likening the AltaRock project to a geothermal effort that fractured the earth beneath Basel, Switzerland, in late 2006. That project was shut down after a 3.4 quake jolted the city, and the developer's insurance company has since paid more than \$8 million to cover damage, the Times reported.

AltaRock and the U.S. Department of Energy both cite several differences between the projects, chiefly that the Swiss developer was fracturing rock along a large known fault that runs directly beneath a major city, increasing the chances of a damaging quake.

"Why they were doing that is beyond us," said Jim Turner, AltaRock's vice president of operations.

Still, with the spotlight on – and \$6.25 million in taxpayer funds committed to the project – federal energy officials are trying to minimize the risk of a public relations debacle. The agency is reassessing the seismic risks of the project, and won't grant AltaRock approval to begin fracturing rock until the review is complete, a spokeswoman said last week.

Turner confirmed that his company had been asked to provide additional information but didn't expect the fracturing work to be delayed.

Even if the AltaRock test turns out not to make life worse in Anderson Springs, earthquake risk stands to complicate the development of geothermal technology in the future.

Geologists haven't identified every fault beneath Earth's surface. And as the industry looks to develop sites that aren't as well studied as the area near Anderson Springs, the chances of encountering – and triggering – an unknown fault will rise, said David Oppenheimer, a seismologist with the U.S. Geological Service in Menlo Park.

"There could be some big faults lurking out there," he said.

AltaRock was founded by a veteran geothermal researcher and has filed more than 15 technology patents, covering everything from proprietary methods for fracturing rock to special instruments designed to handle the extremely high temperatures deep underground.

The company's promise has attracted big-name investors, including Khosla Ventures, Google Inc.'s clean-energy investment branch and Kleiner Perkins Caufield & Byers, where former Vice President Al Gore is a partner.

The federal government also sees the technology making a major contribution to the nation's push for renewable energy. Unlike wind turbines and solar panels, which don't provide electricity around the clock, a geothermal project's steam turbines can run on-demand, like a coal or gas-fired power plant.

A 2007 Massachusetts Institute of Technology study estimated the country could realistically get 10 percent of its electricity from advanced geothermal power by 2050. The economic stimulus package passed in February commits \$400 million to the technology.

Jeff Gospe, a part-time resident of Anderson Springs who has extensively documented the quakes there – at www.andersonsprings.org – says he understands the excitement about AltaRock's project but says it shouldn't trump the well-being of the community.

"They may have this patented technology that they can commercialize," he said. "But we're left with the problem."

At the AltaRock site high on a ridge above Anderson Springs last week, a 175-foot-tall drill rig had already bored nearly a mile deep.

Nearby, inside the company's sparsely furnished office trailer, Turner walked through rooms with rows of computer monitors the company will use to check the progress of the fissures it plans to open in the bedrock. A good crack, Turner said, would be millimeters wide and perhaps a quarter-mile long. By adjusting water pressure and flow, AltaRock hopes to precisely control the openings.

"When they get to where we want 'em, we'll stop," he said.

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