

PROGRESS AND FUTURE PLANS AT THE DESERT PEAK EAST EGS PROJECT

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ABSTRACT

An industry-DOE cost-shared project is underway to evaluate the technical feasibility of developing an EGS power generation project on the eastern side of the Desert Peak geothermal field. Analysis of existing geological and geophysical data is complemented by new geologic mapping and gravity work in the Hot Springs Mountains undertaken by researchers with funding from the Great Basin Center for Geothermal Energy at the University of Nevada Reno (UNR). An existing well (DP 23 1) is the focus of much of the Phase I investigation, including re-interpretation of lithology, acquisition and analysis of a wellbore imaging log, and conducting and analyzing a step-rate injection test. As of June 2003, the project is about half complete; results are summarized below. Phase I work remaining to be completed includes conceptual modeling, numerical modeling and the development of a detailed plan to guide upcoming field activities.

Geological analysis of well DP 23 1 indicates possible target formations for hydraulic stimulation. The uppermost is a Jurassic/Triassic ~300-foot thick quartz monzodiorite with its upper contact at a depth of 5,060 feet; this is correlated across to core hole 35 13 TCH about 1.5 miles to the east. A second intrusive interval of similar age extends from 6,800 to 7,020 feet in DP 23 1 but is not encountered in 35 13 TCH owing to the relatively shallow depth of the core hole. Both of these units contain ubiquitous and healed fractures and veins. A deeper, massive, two-mica granodiorite extends from 7,020 feet to TD (9,641 feet) in DP 23 1; the presence of dikes related to this unit in the deeper part of 35 13 TCH suggests that it is also present in that area, although below the bottom of the core hole. Below about 8,000 feet, this unit becomes less brecciated and less altered than in its upper part.

Two samples from corehole 35 13 TCH were subjected to mechanical testing: a quartz monzodiorite from 3,484 feet and a granodiorite from 3,833 feet. Results indicate very low porosity (< 2.1%) and moderate to high rock strength. Several samples showed evidence of post-failure strength increase, which may represent slippage along pre-existing veins or fractures.

Ultrasonic velocity measurements indicate no anisotropy or open fractures.

Numerous geophysical surveys run by previous owners of the Desert Peak field are of limited use in the context of the EGS project; a seismic noise survey suggests that it may be possible to detect some microseismic events from surface recording locations. A recent gravity survey undertaken by researchers at UNR provides very useful information on the structure of the pre-Tertiary basement, which includes the EGS target formations discussed above. In support of this work, rock samples from all geologic units were provided to UNR for density measurements.

Gravity modeling is now underway to further evaluate basement structure across the EGS area and into the hydrothermal portion of the field, and elsewhere in the Hot Springs Mountains. A wellbore imaging log was acquired in April 2003 in DP 23 1 and is presently being analyzed to evaluate the local stress tensor and to determine if optimally oriented, critically stressed fracture are present. This will assist in identifying a target formation for hydraulic stimulation. While cooling the well for logging, an injection test was run. Analysis of these data confirms that the reservoir around the well has very low porosity, injectivity, flow capacity and storage capacity, and does not intersect any major fracture. Injection for several days resulted in a modest improvement in injectivity. Analysis of the injection test data resulted in the development of a practical, low cost and approximate methodology to measure the success of future hydraulic stimulation.

Work remaining to be completed in Phase I includes conceptual modeling with an emphasis on the pre-Tertiary stratigraphy and structure, numerical modeling to evaluate various fracture parameters and well placement strategies, and planning for Phase II. Future plans for the project in Phase II focus on planning, conducting, monitoring and evaluating a massive hydraulic stimulation of well DP 23 1. Should the stimulation create a large enough reservoir, a second and perhaps a third well would be drilled and stimulated, and the system would be tested for several months to determine its capacity. Ultimately a 2-5 MW stand-alone binary power plant would be built and operated at Desert Peak East, with the power either sold to a utility customer or used to supply the parasitic power for the two existing Desert Peak hydrothermal power plants.

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