



Department of Energy

Washington, DC 20585

Final Management Review of AltaRock Project

Regarding FONSI Public Issuance

December 30, 2009

Context. Assessments indicate that if U.S. geothermal resources can be tapped, significant new base-load power generation can be developed. With this in mind, DOE has undertaken a \$175 million broad-based research, development and demonstration effort to enhance understanding of technology options that can be applied in a variety of geologic circumstances.

Background. In October 2008, DOE and AltaRock announced an Enhanced Geothermal System (EGS) project to drill to 12,000 feet and then to engineer an artificial reservoir by hydro-shearing the rock at 1700 psig. DOE's share is \$6M and this funding is matched by AltaRock.

As the lead agency for evaluating the environmental impact of the AltaRock project at the Geysers, the Department of Interior's Bureau of Land Management (BLM) prepared an Environmental Assessment (EA) and issued a FONSI for the drilling phase in June 2009. DOE is required to issue its own NEPA decision because of the financial assistance being provided to the project.

Due to re-current drilling problems, AltaRock ceased drilling operations on August 30, 2009. The required depth to tap the geothermal resource was not reached.

Over the course of the last several months, DOE has continued to assess expert information and new analysis from other research (e.g., Basel, Switzerland) in order to characterize the potential seismic-induced risks that could accompany this early-stage technology.

Management Review.

- In summer 2009, DOE received several inquiries about potential seismicity impacts associated with AltaRock's proposed reservoir stimulation methodologies which use high pressure water techniques.
- Based on independent technical and scientific review, DOE recommended special conditions for monitoring and operations to BLM for their sundry notice to AltaRock. BLM adopted DOE's recommendations.
- In fall 2009, DOE re-engaged with several of the independent technical experts to confirm findings and to further discuss AltaRock's analysis of this site. The experts re-confirmed that there were minimal risks from the proposed activities and DOE concluded that an Environmental Impact Statement was not warranted at this time. DOE informed the Geysers' community in November 2009 of these findings.
- In December 2009, DOE evaluated a newly published independent seismic risk analysis on the Basel EGS project commissioned by the Swiss public authorities.

This report concluded that the risks for property damage in Basel, given the dense population, were unacceptably high and as a result, the project was terminated.

- The models and simulations developed for the Basel analysis may be useful in predicting the stress changes and probability of seismic activities caused by EGS exploration in other areas. DOE is now establishing projects to model stress changes from EGS activity so that seismic impacts can be predicted prior to stimulation.

Conclusions. DOE deems it critical for AltaRock to adhere to the special monitoring and risk management conditions in the BLM sundry notice and the FONSI. These include but are not limited to the following:

- Instituting the International Energy Agency protocol for managing induced seismicity associated with Enhanced Geothermal Systems. This protocol identifies steps that a geothermal developer can take to extend community outreach and education, cooperate with local authorities, measure induced seismicity, characterize maximum probable events, and enlist independent experts for risk analysis.
- Implementing special conditions for hydro-shearing including placement of ground motion sensors by the U.S. Geologic Survey and Lawrence Berkeley National Laboratory, monitoring and reporting of operational data and events, and instituting procedures for mitigating emerging seismic events up to complete shutdown, if necessary.

DOE will continue to closely monitor worldwide activities in EGS demonstrations and new scientific studies related to EGS-induced seismicity and incorporate necessary precautions into its EGS projects. DOE is now instituting the following policy into new EGS projects:

- DOE will require grantees to collect stress data, background seismicity, and geology data prior to actual field stimulation. Once the data are collected, the grantee will use predictive stimulation models to estimate and forecast potential induced seismicity magnitude and potential radius of seismicity. Information submitted by grantees will be used to develop site specific risk mitigation strategies.
- A DOE team of experts will review these results as a part of go/no-go decision point.
- If judged satisfactory, grantees will be given the go-ahead to conduct field work with adequate permits from local authorities. Otherwise, they will be asked to gather more data and conduct more analysis.