GEOTHERMAL PROGRAM REVIEW X

PROCEEDINGS

"Geothermal Energy and the Utility Market - The Opportunities and Challenges for Expanding Geothermal Energy in a Competitive Supply Market"

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As was stated by the first presenter, the Long Valley Exploratory Well represents a vital linking of geothermal theory, technology and applications. The five presenters take us through that linking to the extent the current progress at the well makes that possible. The site is, of course, a geothermally rich resource, a "recently active" caldera. In many ways, the site has a wealth of data preceding the present work. It is a site which has excited the interest of the geothermal community for a long time. As is often the case in geothermal work, the prior data has raised as many questions as were answered. It is on this basis that the further exploration of a probable high temperature resource is being explored to great depths.

The first presentation represents the cooperation and coordination maintained between similar elements of the Basic Energy Sciences programs and those in the Geothermal programs of DOE's Conservation and Renewable Energy activities. Similarly, the work exemplifies the close coordination of the DOE work with the U. S. Geological Survey, the National Science Foundation, and the U. S. Continental Scientific Drilling Program. The first presentation also represents the theoretical and modelling portion of the session.

Appropriate to geothermal technology, the central programmatic theme is geophysical and geochemical aspects of fluid flow and interaction in porous and fractured rocks. It was interesting to note that even the theoretical work and modelling addressed the applicability to earth-based energy resources, and as well their utilization in a manner such as to assure environmental acceptability. Topics addressed included: 1) fundamental properties and interactions of rocks, mineral, and fluids; 2) transport and flow of fluids in rocks; and 3) structure of geologic units.

The session continued with the description of the Phase II operations at the Long Valley Exploratory Well. The drilling operations were described as relatively trouble free, with some hole deviation near the bottom in basement rock that is hard and abrasive. This phase was drilled to 7588 ft., with 13-3/8" casing set to 6825 ft. The ultimate depth of the well is planned to be 20,000 feet, or at a bottomhole temperature of 500°C, whichever comes first.

Downhole science in the Long Valley Exploratory Well was presented by a representative of the U. S. Geological Survey. It is expected that the well will provide critical information on the structure and evolution of a young volcanic system. During the Phase II work, sidewall cores and coring were emphasized, and borehole televiewer images and measurements of temperature provided significant data on the state of stress and the hydrologic and thermal state of the central part of the caldera. Indications are that cold water is penetrating to considerable depths. During the rest of the fiscal year, hydrologic and stress data will be focused on, as well as obtaining further data relating to the source of earthquakes and as to whether molten rock is still present in a significant volume within 6 to 8 km of the surface.

Personnel from the University of Alaska presented geologic results for this session's third presentation. The relationship of hydrothermal circulation to a large crustal magma chamber is being examined. Further, the well is providing an important test of the models for the subsurface structure of active continental calderas.

Results thus far, primarily from cuttings and cores, generally support the classical view of large intracontinental calderas as piston-cylinder-like structures. Analogy to other caldera systems suggests that the still-cooling crystalline carapace of the caldera magma chamber could be encountered in the next phase of drilling to 13780 ft. When considered with geophysical and downhole measurements, the Long Valley Exploratory Well is expected to provide an improved three-dimensional view of the caldera and its hydrothermal system.

Coming full circle on the session, Sandia personnel concluded with their presentation of "A Model for Large-Scale Thermal Convection in the Long Valley Geothermal Region." Utilization of the model resulted in the inference that, during the early stages of drilling, the vertical temperature distribution may not be a reliable indicator of the presence or absence of the relatively shallow magma body which has been predicted to underlie the geothermal region.

It would seem, in summary, that the planning for the Long Valley Exploratory Well has resulted, already, in obtaining data which furthers the theoretical studies of both generalized and specific caldera systems, and support not only the study of calderas and magma bodies, but also support our ability to predict the existence and location of such resources with increasing accuracy.