CONF-920378--6

DE92 019090

GEOTHERMAL PROGRAM REVIEW X

PROCEEDINGS

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

March 24 - 26, 1992
San Francisco, CA

Sponsored by:

U.S. Department of Energy
Assistant Secretary, Conservation and Renewable Energy
Geothermal Division
Washington, DC 20585

DISCLAIMER

RESERVOIR TECHNOLOGY

J. L. Renner
Idaho National Engineering Laboratory

The reservoir technology program supports the utilization of geothermal resources through development and verification of new earth science technologies for:

- exploration,
- fluid production and injection, and
- prediction of reservoir lifetimes.

A two-fold strategy of conducting DOE-sponsored research to meet higher-risk, longer-term needs and cost-shared research with industry in areas of greatest current need is utilized to maximize the benefit of the program to the geothermal industry.

The program uses a coordinated, multi-disciplinary approach to investigating and solving reservoir problems facing the industry. Research at The Geysers geothermal field has received major emphasis in the past three years. Recent progress in that work will be reviewed in detail by The Geysers operators, federal, state and local regulators and other interested parties during a meeting in Santa Rosa on May 5 and 6, 1992. Hence the papers by Lipman, Bodvarsson et al., Wannamaker, et al., Horne, and Shook in this proceedings volume emphasize non-Geysers research in the program.

The major portion of the reservoir technology research is conducted at two national laboratories: Lawrence Berkeley Laboratory (LBL) and Idaho National Laboratory (INEL), and two universities Stanford and The University of Utah Research Institute (UURI). Supporting research is conducted at Lawrence Livermore (LLNL) and Oak Ridge (ORNL) National Laboratories, and other research institutions and universities. A special relationship exists between DOE and the U.S. Geological Survey (USGS) in which DOE adds small increments of funding to expand ongoing USGS investigations into fields with practical application to geothermal resources (Lipman, this volume).

Research at The Geysers includes the work at LBL reported in this volume by Bodvarsson et al. and the following studies that will be reviewed in greater detail at the Santa Rosa meeting:

- evaluation of seismic imaging at The Geysers by LLNL to delineate steam and two-phase regions,
- experimental geochemical studies at ORNL to determine the genesis of HCl in steam at The Geysers,
- validation at UURI of the suitability of organic compounds as tracers in vapor-dominated systems,
- structural and mineralogic studies at The Geysers by UURI, and
- studies of injection at The Geysers by INEL.

The reservoir technology program also partially funds materials research at Brookhaven National Laboratory (Kukacka, this volume) related to non-corrosive material for use at The Geysers and shares the funding for the geochemical modelling work reported by Weare in the Energy Conversion section of this proceedings.

Two small programs support the understanding of the chemical evolution of geothermal systems and changes in gravimetric pattern of geothermal systems, respectively. Philip Candela at the University of Maryland is studying the partitioning of elements between melt, aqueous liquid phase and vapor to predict transfer of elements to hydrothermal systems overlying magmatic systems. John Goodkind of the University of California, San Diego is developing highly sensitive and accurate gravimeters to determine fluid movement within geothermal systems.

The reservoir technology program has recently initiated a program directed toward increasing the use of the low and moderate-temperature geothermal resources of the United States. The program is managed by the INEL and the research will be conducted by the Idaho Water Resources Research Institute, Oregon Institute of Technology - GeoHeat Center, and the University of Utah Research Institute. The program will update the existing inventories of U.S. hydrothermal resources and provide outreach to potential users of geothermal resources, particularly users of geothermal heat pumps.

INEL supports the geothermal industry's Geothermal Technology Organization, a geothermal industry group seeking to advance the state-of-the-art of geothermal technology through:

- conducting cooperative research under the "National Cooperative Research Act of 1984,
- sharing research costs with the DOE,
- facilitating the industrial development of basic research results, and
- advising the research community of the geothermal industry's needs.

The organization was formalized and entered into an agreement for cooperative research with DOE in the Spring of 1988. Membership is open to all who have an interest in geothermal development.

The Geothermal Technology Organization (GTO):

- funds research in reservoir performance and energy conversion technology,
- seeks research with high probability of short term benefits, and
- shares costs -- industry 51%, DOE 49%.

GTO and DOE have completed studies of the applicability of advanced seismic techniques to monitor injection and productivity enhancement at The Geysers steam field, validation of vapor phase tracers in The Geysers, and tracer return data from an industry tracer-injection test in the southeast Geysers.

Industry suggestions for GTO research or requests for additional information concerning GTO can be made to Mohinder Gulati, Chairman of the GTO or to Joel Renner, DOE Liaison to GTO.

Dr. Mohinder S. Gulati
Unocal Geothermal Division
P.O. Box 7600
Los Angeles, CA 90051
213-977-7870

Mr. Joel Renner
INEL
P.O. Box 1625
Idaho Falls, ID 83415-3526
208-526-9824

ACKNOWLEDGMENT

Work supported by the U.S. Department of Energy, Assistant Secretary for Conservation and Renewable Energy Office of Utility Technologies, under DOE Contract No. DE-AC07-76ID01570.