

# FINAL REPORT

DOE Contract # DE-FG36-01SF22364

Budget Period - August 31, 2003 – August 30, 2004

*Geothermal Information Dissemination and Outreach*

Organization - Geothermal Resources Council (GRC)

GRC Contract Officer - Ted J. Clutter, Executive Director

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## Project Contractor

The Geothermal Resources Council (GRC – Davis, CA) is widely recognized and respected in the U.S. and world geothermal community. The GRC is a 501(c)(3) non-profit educational association with members throughout the United States and the world. The GRC is the major U.S. geothermal professional educational organization, and has been continuously active for 34 years in providing technical information transfer to the professional public about all aspects of geothermal development and utilization. The GRC has worked cooperatively with DOE for over 30 years in furthering industry and government goals for geothermal energy development. With its staff and many volunteers, the GRC has accomplished these goals through technical information dissemination, workshops, symposia and Annual Meetings, and other avenues of public outreach.

## Project Purpose

To enhance technological and topical information transfer in support of industry and government efforts to increase geothermal energy use in the United States (power production, direct use, and geothermal groundsource heat pumps).

## Project Objectives

DOE has provided funding to the GRC for a number of years for ongoing information and technology transfer tasks in concert with industry needs. Under the contract, this included co-sponsorship of the GRC 2003 and 2004 Annual Meetings, publication of the GRC *Transactions* (technical proceedings of 2004 Annual Meeting), publication and distribution of the DOE *Geothermal Technologies* newsletter, and maintenance the GRC Geothermal Research Library and website pages ([www.goothermal.org](http://www.goothermal.org)). Project objectives in performing these tasks were threefold:

- To provide engineering, economic and environmental information and analyses on geothermal technology to the financial, energy user, regulatory, environmental and higher education communities, with the goal of facilitating new, innovative and expanded uses of geothermal energy.
- To provide geothermal energy technical education materials and training opportunities, principally to members of the geothermal industry and associated consultants, as well as to government-supported geothermal scientists, researchers, and engineers at DOE National Laboratories and associated academic research institutions.
- To maintain and provide access to a comprehensive technology database, both as a physical library of printed materials and as a web-based resource, and to respond to inquiries from the professional geothermal community as well as to the public.

## Project Approach

This Final Report describes tasks and outcomes during the budget period – from August 31, 2003 to August 30, 2004. Under the DOE contract, the GRC's goal was to enhance technological and topical information transfer in support of industry and government efforts to expand economical and efficient geothermal energy use in the United States (power, direct use, and groundsource heat pumps). A principal objective was to work cooperatively with DOE's GeoPowering the West Initiative, continuing a long-term and successful partnership with the geothermal industry and DOE. Through its Annual Meetings, publications, comprehensive Geothermal Research Library and expansive electronic database, workshops, and other activities, the GRC provides research, scientific, engineering, economic and environmental information and analyses on geothermal technologies to the financial, energy user, regulatory and environmental communities. Industry volunteers provided a high level of quality involvement and in-kind support.

## 2004 Project Work

### GRC Annual Meetings

GRC Annual Meetings have been co-sponsored by DOE since 1977. Drawing on both U.S. and international expertise, the events provide the world's principal yearly geothermal forum. GRC Annual Meetings provide a venue where GRC members, participants and guests can attend technical sessions to learn about geothermal development projects, ongoing research to reduce development costs, and the latest advances in geothermal power production and other technologies. Principal objectives can be summed up as: 1) Education of key geothermal stakeholders; 2) Provision of a forum for exchange of information, technologies and ideas; 3) Technology transfer on geothermal energy development and utilization; 4) Improvement of international competitiveness of U.S. geothermal goods and services; and 5) Education of the public about the nature and benefits of geothermal energy development. GRC Annual Meeting Technical Programs depend on in-kind efforts of scores of volunteers from the U.S. and worldwide geothermal community, including paper reviews, editing and proofing; and chairing various technical sessions. A Geothermal Energy Association (Washington, DC) Trade Show complements GRC Annual Meetings, offering exhibits that display the latest in geothermal equipment and services. Optional Events, including field trips and workshops, provide technical education opportunities and social interaction that promote international collaboration. A volume of proceedings (see *GRC Transactions*, below) offers all technical papers presented at each Annual Meeting, and is the GRC's most important and widely used publication.

**GRC 2003.** The GRC convened its first Annual Meeting beyond the borders of the United States on Oct. 12-15, 2003, at Morelia's Centro de Convenciones y ExpoCentro. The meeting theme, *International Collaboration for Geothermal Energy in the Americas*, recognized the increasing international character of geothermal resources development. In addition to DOE co-sponsorship, the event was funded by Mexico's Comisión Federal de Electricidad. Approximately 600 total participants (including registrants, DOE personnel comps, CFE personnel comps, Trade Show personnel and guests) from more than 20 countries attended the Annual Meeting. Prior to the event, GRC volunteers convened a *Development of Geothermal Projects Workshop* and *Geothermal Exploration Techniques Workshop*. Both were well attended, with a total of approximately 50 participants. GRC Field Trips were filled to capacity for an excursion to Los Azufres and Parícutin Volcano on Oct. 11. The GRC cooperated with the Geothermal Energy Association (Washington, DC), providing space for its Geothermal Energy Trade Show (a separate function not part of this contract). With co-sponsorship by the Morelia Mayor and Michoacan Secretary of Tourism, the Annual Meeting Opening Session was convened on Oct. 13 at the Teatro Morelos. Dignitaries included the governor of Michoacan, the Mexico Assistant Secretary of Energy, CFE Geothermal Division Director, DOE Geothermal Program Manager, and representatives of the private sector. The 2003 Annual Meeting attracted 160 papers, slated for oral presentations in concurrent sessions and a poster session. Over half the presentations were by participants from around the world – including the United States, Mexico, Latin America,

Europe, Africa and Pacific Rim. DOE provided \$25,000 toward a total of \$50,000 co-sponsorship support during the 2003 budget period. A more comprehensive description of the event was provided in the GRC Final Report to DOE on funding in FY03. **Funding required for this task in FY04 was \$25,000, applied to GRC staff labor expenses.**

**GRC 2004.** Under the theme, *Geothermal – The Reliable Renewable*, the GRC 2004 Annual Meeting convened on Aug. 29-Sept. 1, 2004, at the Hyatt Grand Champions Resort at Indian Wells, CA (near Palm Springs). Paid attendance was the best since 1997, with 358 3-day, 52 1-day, and 15 student registrations. A total of 23 registrants were comped, many of them DOE personnel. Estimated total attendance (including Trade Show personnel, guests and accompanying persons) was ~700. The 2004 Annual Meeting offered a well-attended (36 registrants, including DOE comps) pre-event workshop, *Geothermal Production Well Pump Installation, Operation and Maintenance* (not included under DOE contract). Field trips were also well attended, with 22 registrants for the Coso/Mammoth, and 54 for the Imperial Valley/Salton Sea excursions. The 2004 Annual Meeting Opening Session featured Keynote Speakers from the U.S. Department of Energy (Geothermal Program Director Leland Mink), the U.S. Department of the Interior (Assistant Secretary Rebecca Watson) and the private sector. The GRC cooperated with the Geothermal Energy Association (GEA - Washington, DC), providing space for its Geothermal Energy Trade Show; and the Geothermal Education Office, providing space for its *Introduction to Geothermal Energy Workshop* (neither included under DOE contract). Several local radio and TV station interviews were conducted during the Annual Meeting with GRC representatives during the event. Space and catering for the 2004 Annual Meeting were contracted on a room-night rental guarantee with the Hyatt Grand Champions Resort. The site was selected by the GRC Board of Directors after consideration of bids from three additional venues in and around Palm Springs, CA. The Hyatt Grand Champions Resort offered superior meeting room space and room prices. The event was managed by experienced GRC staff and the 2004 Annual Meeting Committee, with oversight by the GRC Board of Directors and its Annual Meeting Advisory Committee. Planning efforts took place at several committee meetings during the year prior to the event. Committee responsibilities included Technical Program direction, Trade Show management (in cooperation with GEA), fund raising, optional events, invited speakers, field trips, and publicity. Planning also ensured adequate space for DOE meeting rooms. GRC staff devoted a major portion of their time to the 2004 Annual Meeting, creating and distributing advertising and registration materials; handling technical papers for publication; making arrangements with meeting vendors, catering and hotel management; processing meeting registrations; and handling all logistics for publicity, invited speakers, field trips, technical sessions, and Trade Show exhibits (with GEA). Technical Program response for the 2004 Annual Meeting event was excellent, with 136 technical papers on geothermal resource and development (including groundsource heat pumps) accepted by the GRC from around the world. Twenty-five Technical Program volunteers reviewed papers for quality, content and relevance. Annual Meeting Committee members and Technical Program reviewers offered their services and assistance on a voluntary basis, totaling approximately 1,000 hours (plus air fares and daily expenses). At an average industry and academic consulting rate of \$75 per hour, that service represented \$75,000 worth of in-kind contributions to the 2002 Annual Meeting. Technical Program sessions at the GRC 2004 Annual Meeting focused on issues of vital interest to the worldwide geothermal community. Volunteer session chairs solicited papers, helped develop each program, assisted in paper review, and hosted each session at the Annual Meeting. All papers were published in Volume 28 of the GRC *Transactions* (see below). Session Chairs and Presenters at the 2004 Annual Meeting devoted approximately 2,000 hours of in-kind service to the event. At an average industry and academic consulting rate of \$75 per hour, this represented \$150,000 of in-kind service to the Annual Meeting. As shown in attached budget notes for the event (Appendix B), GRC 2004 Annual Meeting expenditures, revenues and contributions (including cash and in-kind services) fell within reasonable limits.

#### **Volume 28, GRC *Transactions* (GRC)**

Published as a high-quality, durable casebound volume, the GRC *Transactions* is a key information and technology transfer source for the U.S. and worldwide geothermal community. A

standard reference for geothermal experts worldwide, the GRC *Transactions* contains the majority of technical papers presented at GRC Annual Meetings (above). The volume provides extremely useful information about the latest advances in geothermal resource characterization, technologies, and methods for geothermal resource exploration and development. The GRC has produced a comprehensive volume of *Transactions* in conjunction with its Annual Meetings since 1977. Volume 28 of the *Transactions* published 119 out of 136 technical papers (692 pp) presented at the GRC 2004 Annual Meeting. The papers were submitted by geothermal experts and professionals from around the world. The papers were reviewed over a 2-day period by 25 volunteer (in-kind) geothermal experts from the private sector and DOE National Laboratories. GRC staff received and cataloged the papers, maintained interaction with authors for revisions and corrections, and worked with an out-source publication designer (Karen Downs – Sacramento, CA) and printer (Commerce Printing – Sacramento, CA) to compile the papers into book form for publication for delivery at the 2004 Annual Meeting. The GRC charges \$65 per copy (1/3 of production cost). Three-hundred copies (300) are printed each year. Most are sold during the Annual Meeting and ensuing months. The remainder are stored as future stock and reference materials. **DOE 2004 funding required for this task was \$38,819.**

#### **DOE Geothermal Technologies Newsletter (GRC)**

The Office of Geothermal Technologies quarterly newsletter, *Geothermal Technologies*, is produced at the National Renewable Energy Laboratory (NREL). This 2-color, 4- to 16-page newsletter summarizes federal geothermal research and development projects and other DOE geothermal news. The newsletter is meant to raise awareness of DOE geothermal development efforts among professionals and the public. To cost effectively help DOE reach the U.S. and world geothermal community (government agencies, academic research institutions and industry stakeholders), the GRC has distributed the *Geothermal Technologies* newsletter since the early 1990s as an insert within the bi-monthly GRC *Bulletin*. The GRC receives newsletter disk copy and color-key proof from NREL for each newsletter, then follows through with print production and distribution. Circulation is 1,000 per issue (plus 300 copies of the newsletter shipped to NREL for internal and public distribution). During the project period, the GRC printed, stitched and bound the *Geothermal Technologies* newsletter into the Sept/Oct 2003, Jan/Feb 2004, and May/June 2004 editions of the GRC *Bulletin*. Multiple copies (300) of the newsletter sans magazine were provided to NREL for internal DOE distribution. **2004 funding required for this task was \$8,388.**

#### **GRC Geothermal Research Library**

With DOE assistance since 1992, the GRC has built the largest and most comprehensive physical library in the world devoted to geothermal energy. The GRC Geothermal Library is maintained at low administrative, personnel and overhead costs. It provides rapid accessibility to the majority of technical literature crafted over the past 30 years, and preserves hard copy and on-line databases for future use by geothermal researchers and developers. A bibliography for over half of the physical library's citations is available through keyword search on the GRC web site ([www.geothermal.org](http://www.geothermal.org)). The GRC maintains one employee to catalog donated libraries, thus increasing the number of available citations. Document collection is ongoing, with regular database additions. Continuing development of the GRC On-Line Library includes: 1) data entry and development of keywords for additional citations; 2) filing library publications; 3) maintaining and enhancing the website; 4) purchase of publications and geothermal articles; and 5) maintenance of computer and other equipment. During the past year, Versteegh Design (Sacramento, CA) provided complete new web page layout for the GRC, to make the website more attractive and user friendly, thus enhancing technology information transfer. Prior to redesign (according to web server SolarHost) the GRC website received approximately 30,000 page "hits" per month. Following redesign, the number of page hits increased to an astounding 243,000 per month by November 2003. The GRC expects this number to grow with further enhancement of its website, including posting over 20,000 pages of GRC copyrighted materials in pdf format (funded by another source). **2004 funding required for this task was \$45,879.**