The Geothermal Resources Council (GRC) would like to thank all the people who expressed an interest and returned the form from the First Circular for the **1990 International Symposium on Geothermal Energy.**

From the interest shown, the GRC was able to complete this Second Circular, which contains detailed information about the upcoming meeting.

To receive additional information on the Trade Exhibit, the Photo Contest, Author's Packet and GRC Membership, please call the GRC office, or complete the form at the end of this flyer. This form will be your official mailing label, so please print clearly.

The Registration Flyer will be mailed to the entire GRC master mailing list in late February 1990, (If your address has changed, make sure you have completed an address correction request with the GRC so you will receive the Registration Flyer).

DO NOT SEND MONEY WITH THIS FORM

1990 International Symposium Geothermal Resources Council Annual Meeting

The GRC is legally required to hold an annual meeting every year. Annual meetings are held in various cities throughout the western United States. In addition to fulfilling the legal requirement, the annual meetings feature simultaneous technical sessions, poster sessions, trade exhibit, special features, field trips and social functions. A set of the Transactions of all papers submitted is published each year. The 1990 Annual Meeting will be expanded into the **1990 International Symposium.**

Call For Papers

The 1990 International Symposium on Geothermal Energy is intended to provide a forum for exchange of new and significant information on all aspects of the exploration and use of geothermal resources. In keeping with the worldwide scope and the Hawaiian venue of the 1990 Symposium, the Organizing Committee is planning three special sessions:

I. COUNTRY UPDATES: Invited papers summarizing progress in exploration, development and utilization since 1985.

II. INTERNATIONAL RESEARCH AND DEVELOPMENT: Major advances since 1985 in technology, utilization and understanding of geothermal resources.

III. GEOTHERMAL DEVELOPMENT IN HAWAII.

Papers may be submitted in the following subject areas:

1. EXPLORATION AND RESOURCE EVALUATION
   a. Resource identification
   b. Resource assessment
2. WELL TECHNOLOGY
   a. High-temperature drilling
   b. Materials
   c. Logging
3. RESERVOIR DEVELOPMENT
   a. Testing
   b. Stimulation
   c. Reservoir engineering
   d. Reservoir geochemistry
   e. Modeling
4. ELECTRIC POWER GENERATION
   a. High-temperature
   b. Intermediate temperature
5. DIRECT-USE
   a. Multi-purpose use
   b. Byproducts
6. ENVIRONMENTAL AND WASTE DISPOSAL
7. SOCIETAL AND INSTITUTIONAL ASPECTS
8. ECONOMICS, FINANCING AND MARKETING

Technical papers may be submitted in any of the following categories:

1. Oral presentation with publication in the GRC Transactions.
2. Poster presentation with publication in the GRC Transactions.
3. Poster presentation without publication in the GRC Transactions.
4. Publication in the GRC Transactions only.

Oral presentations will be limited to 25 minutes, including questions. Presentations that rely on detailed graphics, maps or tables are encouraged to utilize the poster-session format. Each poster-session author is required to be in attendance at the 3-hour session at which his/her poster is displayed. Final assignment of papers to oral or poster presentation will be at the discretion of the Program Committee.

The deadline for submission of papers (in the required format) to the GRC office is **15 March 1990.** Authors will be notified of acceptance of their papers for oral presentation, poster presentation or publication by **7 April 1990.** All papers should be two to six pages in length, typed single-spaced in dual columns on 11" x 14" blue-lined sheets provided by the GRC. Only those papers which conform to this format will be considered. Author's Packets containing detailed instructions and the required blue-lined sheets may be obtained from the GRC office either by telephoning or by completing the form at the end of this Circular.

discovery of the geothermal fields in California's Imperial Valley, and in Nevada and Utah. Every other place where the industry has gone and drilled has been sparked by some type of surface manifestation. In my view, the key for the future of geothermal energy lies in the development of new exploration thinking and techniques. At The Geysers, there was a hidden resource that was much larger than any of the pioneers ever imagined. The question we have to ask ourselves is, "Are there other resources that are completely hidden?"

We hear those in the oil patch lament today that all of the easy-to-find oil has already been discovered. I think that is the case for geothermal energy, too.

To find commercial-sized reserves today is going to take diligence and hard work. We are going to have to make new advances in exploration techniques and thinking, using all the tools available to us and inventing new ones.

We know how to drill for the resource. We know how to produce hot water resources, even under the most severe conditions such as at the Salton Sea. Although reducing drilling costs will remain forever a goal, the real challenge is finding the resource that we can drill for and produce.

The geothermal industry also continues to be dogged by market forces. Oil prices continue well below their historic highs. Today we have plentiful oil and natural gas supplies, and the general perception is that this will last. As a result, the enthusiasm for geothermal energy outside of our industry is less than exuberant. But the warning signs of another energy shortage are beginning to show. This summer, for the first time in more than a decade, the United States imported more than half of its oil requirement. Demand for gasoline and oil continues to rise, and the nation is not doing any energy planning. We have had a worldwide glut of crude oil and a "bubble" of natural gas. The idea of allocating resources on a national or global scale with maximum efficiency is just a dream. We have proven that geothermal energy can be an important part of the energy mix for a nation. Here is California, The Geysers has been an integral part of the northern California electrical grid.

The Philippines is an excellent example of a successful effort to develop geothermal resources. For a country which imports virtually all of its oil and coal, geothermal energy has proven itself a cost-effective and reliable source of electrical power generation.

Indonesia, even with its significant indigenous oil supply, has the foresight to develop other sources of energy, including geothermal. In this way it will use less of its valuable oil for domestic development.

In the last few years in the U.S., private resource producers have moved downstream to power generation in order to bring additional geothermal resources on line and to keep the industry growing.

We still have a viable commodity — a commodity which should be an important part of the energy planning in the United States and elsewhere.

Oil prices will rise again. When, is the question. But just as we know that oil prices will eventually rise, we also know that geothermal energy cannot be part of the alternative energy scheme unless we, as businessmen, are willing to provide the risk capital to develop new projects. We must continue to develop new exploration techniques, production processes and drilling tools to improve the efficiency of geothermal energy production.

At the same time, government must take the lead and establish long-term national energy policies and create the political and investment climate that encourages the development of diversified energy resources — including geothermal energy.

Geothermal energy is at a crossroads. We have reached a plateau. Whether we retrench or continue upward will depend upon the determinaton and creativity of each of you.

The Geysers became the world's largest and most successful geothermal project, not by luck, but because of this creativity and determination. We laid the foundation here from which all other geothermal energy projects in the U.S. have been born. It is now our responsibility and challenge to keep the geothermal industry alive and viable. It is up to each of us to break new ground, find new resources and produce them economically.

The Geysers project serves to remind us that geothermal energy is a viable energy alternative. It reminds us of the entrepreneurship that gave birth to our industry. It beckons images of "Mac" McCabe, Dan McMillan and others, people with a vision to make geothermal energy a commercial reality.

The Geysers was built on the early work of Italy and New Zealand. The private sector legacy of The Geysers lives on today in the Imperial Valley, in the Philippines, in Indonesia — wherever people from our industry go looking for geothermal energy.

Thank you very much for inviting me to be your keynote speaker. □

1990 INTERNATIONAL SYMPOSIUM ON GEOTHERMAL ENERGY

Kona Surf Hotel • Kailua Kona, Hawaii

20 - 24 August 1990

15 February:	Payment on Airfare and Hotel Deposit Due
15 March:	Deadline for Submission of Papers
7 April:	Notification of Acceptance/Rejection of Papers
30 April:	Paper Withdrawal Date
5 July:	Photo Contest Entries Deadline

The opening sentence of the paper I prepared in April for the 1991 Transactions was, " After a 20 year effort, the first increment of commercial geothermal energy is on line ...". Unfortunately the menehunes (Hawaiian for gremlins) stepped in and we still do not have any commercial geothermal on line in Hawaii. I will tell you more about that later.

BACKGROUND

The dislocations that occurred in the global oil market in the 1970's and in 1990 were particularly critical for Hawaii which is 90% dependent on imported petroleum for its electricity. Oahu, with 80% of the State's population and electrical demand, relies almost totally on oil-fired electricity. Further, Oahu has no indigenous resources that could make a significant contribution of firm electricity. The islands in Hawaii are not electrically interconnected.

Geothermally produced electricity appears to a solution to solving Hawaii's critical energy problem. Toward this goal, the state embarked on supporting the efforts to determine the viability of this resource.

Four shallow geothermal wells were drilled in the Kilauea East Rift Zone (KERZ) in the 1960's. This exploration indicated that deeper wells would be needed to recover a viable resource. The Hawaii Geothermal Project led to the drilling of the successful HGP-A well in the lower KERZ in 1976. The well was drilled to 1,951 meters with a bottomhole temperature, in a shut-in condition, of 360 degrees celsius.

In 1981, with support from the U.S. Department of Energy, the State built a demonstration 3 MW wellhead generator plant at HGP-A which operated until December 1989 when it was permanently closed down.

Commercial deep well exploration began in 1980. One developer gave up in 1985 after drilling 3 wells plus a sidetrack generally south of HGP-A. Although high temperatures were attained, the degree of permeability was not commercially adequate. In the same 1980 to 1985 period another developer, Puna Geothermal Venture whose operating partner was Thermal Power Company, drilled 3 successful wells slightly north of HGP-A. All 3 wells were producers but 2 were plugged because of casing problems.

Wyoming-based True/Mid-Pacific Geothermal Venture commenced exploratory drilling in the Kilauea Middle East Rift in late 1989 following an eight year permitting effort including a major land exchange. They are permitted to explore for, and incrementally develop, up to 100 MW.

The potential for large-scale geothermal activity has caused some public concern about environmental effects and impact on land use. Proper management of its limited land and the need to preserve its uniqueness yet allow for reasonable development has been a major issue for the people of Hawaii for many years. In 1983 the Legislature enacted the Geothermal Resource Subzone Assessment and Designation Act which stated that the exploration and development of Hawaii's geothermal resources is of statewide benefit, and that this interest must be balanced with preserving Hawaii's unique social and natural environment. The law mandated the establishment

of Geothermal Resource Subzones, only within which geothermal development activities could take place. Because geothermal development was not a permitted activity in any of Hawaii's broad land use districts...Conservation, Agricultural, Rural and Urban...this Act also provided for a geothermal land use permitting process. The Board of Land and Natural Resources assessed the state on a county-by-county basis. By 1985 three Geothermal Resource Subzones totalling 22,000 acres had been designated in the KERZ and another 4,000 acres in the Haleakala Southwest Rift Zone on Maui.

The State continued through the 1980's to try to stimulate geothermal development:

o The statutes were changed to permit waiver of geothermal royalty payments to the State for up to 8 years.

o In 1987, Governor John Waihee appointed a blue ribbon Governor's Advisory Board on the Geothermal/Interisland Cable Project to determine what should be done concerning geothermal development and what the State's role should be. In their initial report the Board noted that the development of 500 MW geothermal energy on the Island of Hawaii for transmission to the Island of Oahu is feasible and highly desireable. The report recommended that the geothermal and cable projects should be undertaken as one integrated project and the project should be private sector undertaking. The Board forwarded two bills to the Legislature via the Governor, one for a Public Authority to facilitate geothermal and cable development, and the other to establish a consolidated geothermal/cable permit application and review process. Although the bill to establish a Public Authority did not survive because

some were concerned about the potential for "public power", the consolidated permitting bill was enacted. It required all State and County agencies and invited Federal agencies to participate. Invited Federal agencies have all accepted.

o Recent Legislative sessions have appropriated over $10 million for geothermal resource verification and exploration. The State has contracted with the University of Hawaii for four small diameter Scientific Observation Hole (SOH) program and has retained consultants to advise on further elements of exploration with public funds. At the State's request, Congress appropriated $5 million in FY 1991 for Hawaii's exploration program.

o In 1981, the State initiated the Hawaii Deep Water Cable program to determine the feasibility of a 500MW interisland transmission system between the Islands of Hawaii and Oahu which necessarily would encounter ocean depths of almost 2000 meters. The State's $5 million portion of the program involved Hawaii-specific elements including: integration of the cable with the existing electrical grid on Oahu; economic, legal, financial, and institutional analyses; environmental analysis; overland and ocean route analysis including bathymetric surveys; and public information. The Federal Government share of $23 million has been used to: design, fabricate and laboratory test a cable; develop cable vessel and cable laying parameters; and perform at-sea deployment and retrieval tests on a surrogate cable in the most difficult portions of the ocean route. This program was satisfactorily completed in December, 1989.

o The State has contracted for the preparation of a Master

Development Plan for the large-scale geothermal/cable project, additional overland corridor analyses, an Environmental Impact Statement and a public information and participation program.

o The State participated with the Hawaiian Electric Company in the preparation of a Request for Proposals and subsequent actions to select a consortium to finance, develop, own and operate the large-scale geothermal/cable system. The State has retained legal services and a financial consultant to advise on the type and level of State support to the consortium.

The Hawaiian Electric Company is negotiating with Kilauea Energy Partners toward a Purchase Power Agreement for the large-scale geothermal/interisland transmission project. Mission Energy Company heads the partnership. Other members of the Kilauea consortium continue to be Fuji Electric, Sumitomo Corporation of America, Pirelli Cable Corporation, Dillingham Construction Pacific Ltd., and Pacific Turbine Systems. The two parties were close to signing a Memorandum of Understanding but that has been delayed due to the recent unexpected August resignation of HECO's negotiator.

In early 1991, Puna Geothermal Venture, now wholly owned by OESI Power Corp. (formerly Ormat Energy Systems, Inc.) was close to delivering the first increment of an ultimate 25MW capacity to the utility on the Island of Hawaii. On June 12, 1991 while drilling injection well KS-8, a 31 hour blowout occurred when they hit steam at 3800 feet. That blowout caused evacuation of some nearby residents and was the source of over 100 health complaints. Both the County and the State Department of Health immediately

suspended drilling operations and the County later expanded the suspension to include non-drilling activity including work on the gathering systems and power plant. Puna Geothermal Venture, under a Proclamation of a State of Emergency issued by the County Mayor, has been working to first quench the KS-8 well and then bring it fully under control. Absolutely full control was achieved in late September. Concurrently with getting the well under control, the County and State instigated third party investigations of the drilling equipment and procedures as well as the noise and emission abatement and monitoring. A third element of the investigation was a thorough in-house review of the emergency response procedures. The investigative reports including recommendations were received by the government on July 24 and released to the developer and the public the following day. Since mid-August, a joint State-County Task Force has been meeting at least weekly to develop an action plan toward implementing the numerous investigative recommendations. Puna Geothermal Venture's report on the blowout and their comments on the investigative reports were received by the government in early September. Both the government and PGV are striving to resolve the critical issues so that development can resume.

True/Mid-Pacific Geothermal Venture completed four legs from the same bore in the middle KERZ in 1990 and expects to complete another set of wells during 1991.

The University of Hawaii completed three Scientific Observation Holes in the lower and middle KERZ at a total cost of over $5.5 million. All revealed high temperatures and future tests may

indicate that at least several have good permeability.

A draft Master Development Plan for the large scale geothermal and interisland cable project has been completed; a State EIS is ready to get underway; and the optimal interisland transmission system is under review.

Earlier this year, a federal court directed no further federal involvement in Hawaii's geothermal program, such as funding, permits or supportive interagency meetings, until a federal (or NEPA) Environmental Impact Statement is completed and accepted. It is the US Department of Energy's intent to have the Oak Ridge National Laboratory conduct this EIS using part of the $5 million appropriated by Congress last year for Hawaii's geothermal exploration program. We are working with the USDOE toward a cooperative process for completing both the federal and state EIS.

Although the State of Hawaii is urgently in need of indigenous alternatives to imported petroleum, which accounts for 90% of its electricity, the conversion has been slow. The alternatives, such as geothermal, are cause for concern with many residents because they are an "unknown". Further, Hawaii's people are understandably protective about their beautiful islands and tend to view new electric power facilities with concern. These attitudes cause regulators to proceed cautiously with geothermal development. Events, such as the June 12 blowout reduce public confidence.

Recent surveys, however, indicate that the seventy percent of Hawaii's people want geothermal energy. We are confident that industry can provide Hawaii with an energy alternative that is economic, environmentally sound and socially acceptable.