GEOTHERMAL PIPELINE

Progress and Development Update
Geothermal Program Monitor

GENERAL

Geo-Heat Center Update

Kevin Rafferty and Tonya Boyd of the Geo-Heat Center have recently prepared a "Geothermal Greenhouse Information Package" publication. This package of information is intended to provide a foundation of background information for developers of geothermal greenhouses. The material is divided into seven sections covering such issues as crop culture and prices, operating costs for greenhouses, heating system design, vendors and a list of other sources for information. Copies are available from the Geo-Heat Center.

GRC Geothermal Pioneer Award

The Geothermal Resources Council (GRC) recently awarded Paul J. Lienau and John W. Lund the group's 1997 Geothermal Pioneer Award. The award, presented at an honors and awards luncheon in Burlingame, California, recognized the two men for their development efforts in the utilization of geothermal resources. Under Lienau's direction, the Geo-Heat Center's professional staff engaged in research and development activities, made numerous national and international presentations and developed a resource library. Lienau retired as Director in June, after being at Oregon Institute of Technology since 1968. Lund, the Center's current Director, has received numerous awards for teaching and scholarly achievements, and has participated in national and international geothermal research projects. Both have been involved in geothermal projects for over 20 years and have participated in numerous GRC activities.

MEETING

The 23rd Stanford Workshop on Geothermal Reservoir Engineering will be held at the Holiday Inn, Palo Alto, CA, from 26-28 January 1998. The aims of the workshop are: 1) to bring together engineers, scientists and managers involved in geothermal reservoir studies and development, 2) to provide a forum for the exchange of ideas on exploration, development and use of geothermal resources, and 3) to enable prompt and open reporting on progress. The workshop registration fee is $300 (before Jan. 1), proceedings $30 and field trip to The Geysers on the 29th ($30). Information can be obtained from Dorie M. Wolf, Department of Petroleum Engineering, Stanford University, Stanford, CA 94305-2220, Phone: 650-725-2723, Fax: 650-725-2099, E-Mail: dorie@pangea.stanford.edu. Additional information and registration forms can also be obtained by E-Mail: http://ekofisk.stanford.edu/geoth/abstrregister98.html.

CALIFORNIA

The Geysers Effluent Injection Project

Energy producers at The Geysers plan to start injecting Clear Lake water into the steam fields today (Sept. 26) as part of a $45 million project aimed at reviving the world's largest geothermal complex. The first-of-its-kind project, which mixes fresh water and treated effluent from Lake County, may become the model for Santa Rosa's wastewater disposal system. But, it could be weeks or months before geothermal operators see an increase in steam pressure at their electric generating plants.

Work is finished on a 29-mile pipeline from Clear Lake that can carry up to 5,400 gallons of water per minute to The Geysers. The pipeline, pump station, storage tanks and other elements of the system have been tested and they all performed well according to Mark Dellinger, Lake County's resource manager. The water started flowing into steam wells operated by Northern California Power Agency, a consortium of cities that included Healdsburg and Ukiah. The following week, the Lake County water is expected to begin flowing into geothermal wells operated by UNOCAL and Calpine, two companies that supply steam to PG&E's generating plants. In all, the imported water will serve 24 steam wells and six power plants in Sonoma and Lake counties. Engineers say injection could restore 70 MW of power, enough to serve 70,000 households.

The geothermal industry is sharing the costs, and the state and federal governments are also contributing to the project. During the early stages of the project, the flow will be mostly fresh water from Clear Lake. But, more wastewater will be added as time goes by. Santa Rosa is currently considering a similar pipeline to The Geysers as a way to dispose of treated wastewater from its regional treatment plant; however, the project could face environmental opposition. In Lake County, pipelines critics warned about possible wastewater spills, and the prospect of earthquakes caused by water injection. A Santa Rosa pipeline would serve a different part of The Geysers and would probably cost more than $200 million.

On October 16, the Lake County pipeline will be dedicated by representatives of the county, state, federal government and the geothermal industry (Steve Hart, *The Press Democrat*).

The Geysers Effluent Injection Project Dedication

Dedicated on October 16, 1997, the world's first waste water-to-electricity system became one of America's premier examples of genuinely sustainable development. The waste water from three communities is recycled through a geothermal steam field to create enough electricity to sustain the communities' power needs indefinitely into the future. A 29-mile pipeline carries 7.8 million gallons per day of treated waste water effluent and make-up water from Lake County, California, treatment plants to three Geysers geothermal steam supplies: Unocal Corporation, Calpine Corporation and the Northern California Power Agency (NCPA). These steam suppliers operate secondary pipelines that distribute the effluent to geothermal injection wells. Power plants operated by NCPA and Pacific Gas & Electric Company received

steam supplies created by the effluent injection. Depending upon steam recovery rates from the injected effluent, the project will result in a gain of approximately 70 MW in power output. This will equate to as much as 625,000 MWH of clean, low-cost electricity generation annually for the originating communities and millions of other California consumers. In addition to these energy benefits, the project will also provide a long-term, environmentally-superior method of waste water disposal for the originating communities of Clearlake, Lower Lake, and Middletown; and help create and retain jobs that depend on effective waste water systems and a viable geothermal industry.

Construction of the effluent pipeline and associated waste water treatment plant improvements total approximately $45 million. The public/private financing plan uses county waste water funds, federal and state financial assistance, and Geysers operator's funding. The Geysers operators will also spend an additional $7 million on secondary distribution and injection facilities within the geothermal steam field.

The main effluent pipeline will be owned and operated by the Lake County Sanitation District to a point of delivery near Hwy 175, Unocal, Calpine and NCPA will own and operate the final segment of pipeline and the pump stations up to The Geysers. NCPA will use the effluent-based steam in its own power plants, and PG&E will purchase effluent-based steam from Unocal and Calpine for its power plants (from material developed by Mark Dellinger and Eliot Allen)(see also *GHC Bulletin*, Vol. 18, No. 1 for more details).

Five Eras of Geothermal Energy - New Publication Highlights the History of The Geysers

In the panorama of geothermal events at The Geysers in northern California, five historical eras overlap in a mosaic of time. The intriguing story about man's interaction with geothermal energy in this unique resource area--including a wealth of photographs and information never before published---is now available in *The Geysers Album: Five Eras of Geothermal History*, a beautiful new 52-page book from the California Division of Oil, Gas and Geothermal Resources.

According to author Susan Hodgson, "The first era of untouched wilderness ended abruptly as the second era began 12,000 years ago, when Indians in the region first found The Geysers." The era to follow was the age of "organized tourism" that began around 1848.

"Users in these early eras focused on geothermal surface features as sources of pleasure and cures" says Hodgson, who notes that while Native Americans may still visit thermal features at The Geysers, "most tourism ended in 1980 when the last remnants of The Geysers Resort were razed."

The fourth and fifth eras of man's interactions with the area include the age of electrical power development, generated with steam extracted from the field's vast, underground geothermal reservoir. "The fourth era began in 1921 and ended in the early 1930s, to generate electricity to light The Geysers Resort," notes Hodgson.

Sparked by that legacy, she continues, "The era of modern power development began in 1955, when the first modern steam well was drilled in the area, and continues today." Indeed, though peak production leveled off in the mid-1980s, The Geysers still generates more electricity than any other geothermal field in the world

Copies of *The Geysers Album: Five Eras of Geothermal History*, are available for only $5.00 each from the California Division of Oil, Gas and Geothermal Resources, 801 K Street, MS-20-20, Sacramento, California 95814-3530. Telephone: (916) 445-9686, Fax: (916) 323-0424 (*GRC BULLETIN*, Vol. 26, No. 9).

IOWA

EPRI and Interstate Power Company Forge Partnership

EPRI and Interstate Power Company have forged a partnership to promote geothermal energy technology for commercial and residential use, including a regional Geothermal Information Office (GIO) located at Interstate Power's corporate headquarters in Dubuque, Iowa. Interstate Power is already conducting a broad geothermal assistance program (use geothermal heat pumps) for both residential and commercial customers, and will incorporate this program to provide a wider range of service to its customers.

The utility and EPRI recently were instrumental in having geothermal technology chosen for the upcoming construction of a professional ice arena in Dubuque. The renewable energy source will heat the facility, while simultaneously creating the ice skating surface and will also provide energy for heating the arena's water. The new arena will also provide a large percentage of the energy needed to heat an adjacent shopping complex, and plans are underway to use geothermal energy in the development of several local subdivisions (EPRI, *End-Use News*).

WASHINGTON, D.C.

Geothermal Energy Association's New Website

The first phase of the Geothermal Energy Association's (GEA) new website is now on the Internet and can be found at http://www.geotherm.org. The GEA's website currently displays basic information, including a brief description of the organization, its member companies, GEA's Board of Directors and staff, a calendar of events, some geothermal "factoids" and links to other geothermal sites.

Planned enhancements to the GEA website include the addition of photos and graphics, information about geothermal projects involving GEA members, a publications list (with capability to download listed documents, links to GEA member company websites, summaries of GEA's programs and activities, and information on joining the GEA (News Briefs, *GRC Bulletin*).

WYOMING

Yellowstone National Park

Nearly dormant for 20 years, Giant Geyser has erupted 33 times this year. Giant has erupted every three to four days during the past two months, a rate matched only between 1952 and 1955. After the 1959 Hebgen Lake earthquake, Giant rarely erupted and Grotto became more active--typical of shifts in the areas thermal energy. Giant is located in the Upper Geyser Basin, about a mile southwest of Old Faithful. It produces a tower of water up to 250 ft (76 m), twice the

height of Old Faithful. The eruptions usually last for more than an hour, spewing about one million gallons (3,800 cubic meters) of boiling water. Giant's awakening coincides with a renewal of activity in the nearby Splendid Geyser, which has been dormant through most of this century. The Splendid, Giant and nearby Daisy Geyser, which also has shown increased activity, could be linked through the underground tunnels and vents responsible for much of Yellowstone's thermal activity (*Oregonian*, Nov. 16, 1997).

COSTA RICA

Oxbow Power Corp. Selected to Lead International Consortium

In mid-September, the Costa Rican government upheld the selection of an international consortium led by Oxbow Power Corp. (West Palm Beach, FL) to develop the country's first Build-Own-Transfer (BOT power project - the 27.5 megawatt Miravalles III geothermal plant in Guanacaste Province. Other members of the winning consortium are Baruberi Corp. (Tokyo) and Oxbow Services, Inc. (Reno, NV). Negotiations on project contracts are expected to begin soon (*GRC Bulletin*, Vol. 26, No. 9).

ST. VINCENT (CARIBBEAN)

La Soufriere Volcano

In July, St. Vincent and Grenadines Communications Minister Jerry Scott said his government will map the geothermal energy potential of the La Soufriere volcano in an effort to reduce the tiny nation's diesel fuel imports. Hydroelectric power generation already produces 44 percent of total energy requirements; but, St. Vincent's diesel import bill reached over $7 million in 1995 (Geothermal Energy Association, *First Alert*).