GEOTHERMAL PIPELINE

Progress and Development Update
from the Geothermal Progress Monitor

OIT's GEO-HEAT CENTER DIRECTOR PAUL LIENAU RETIRES

Paul J. Lienau retired as Director of the Geo-Heat Center at Oregon Institute of Technology (OIT) on June 30. He held the position since the Center was established in 1975; John W. Lund assumed the position on July 1.

Paul's career in geothermal energy utilization began in 1974, when he co-chaired the *International Conference on Geothermal Energy for Industrial Agricultural and Commercial-Residential Uses*--the first international conference held in the United States that was devoted to direct applications of geothermal energy.

Interest in low-to-moderate temperature geothermal resources generated by the 1974 conference prompted establishment of the Geo-Heat Utilization Center (now the Geo-Heat Center) the following year.

A faculty member of the OIT Physics Department at the time, Paul's interest in geothermal energy persuaded him to move into the new center--at first on a part-time basis, and within a year as full-time director. The Center's first publication, edited by Lienau and Lund, covered the 1974 conference. The *Geo-Heat Center Quarterly Bulletin*, which debuted shortly afterwards, is now in its 22nd year, with 70 issues and 2,400 subscribers. Paul and John have been co-editors of the publication since its inception.

As Geo-Heat Center Director, Paul has been active in many research projects, most of them funded by the U.S. Department of Energy. He has lectured for the Geothermal Institute, University of Auckland New Zealand (1982) and for the Geothermal Research and Training Center, University of Tianjin, P.R. China (1988).

Paul has also been active with the Geothermal Resources Council (GRC) as a field trip leader and annual meeting session chair, and has presented a number of technical papers at council events. His most recent project involved coordinating a "Low-Temperature Resource Assessment of 10 Western States," and helping complete a "Ground-Source Heat Pump Case Studies and Utility Program." In 1993, the GRC awarded the Geo-Heat Center with its Geothermal Special Achievement Award.

Paul also contributed two chapters to the Geo-Heat Center's publication, *Geothermal Direct Use Engineering and Design Guidebook*, one of the most important technical assistance publications on the subject. The Guidebook is currently being revised and updated.

Paul has retire with his wife, Colleen, to Camano Island in the Puget Sound area of Washington State. Along with ample time reserved for golf and fishing, he plans to help his son, Mike, with various video projects--including continuing work on Mount St. Helens.

MEETINGS

Geothermal Resources Council Annual Meeting, Hyatt Regency, San Francisco Airport (Burlingame), October 12-15, 1997. Contact GRC, PO Box 1350, Davis, CA 95617 (Phone: 916-758-2360).

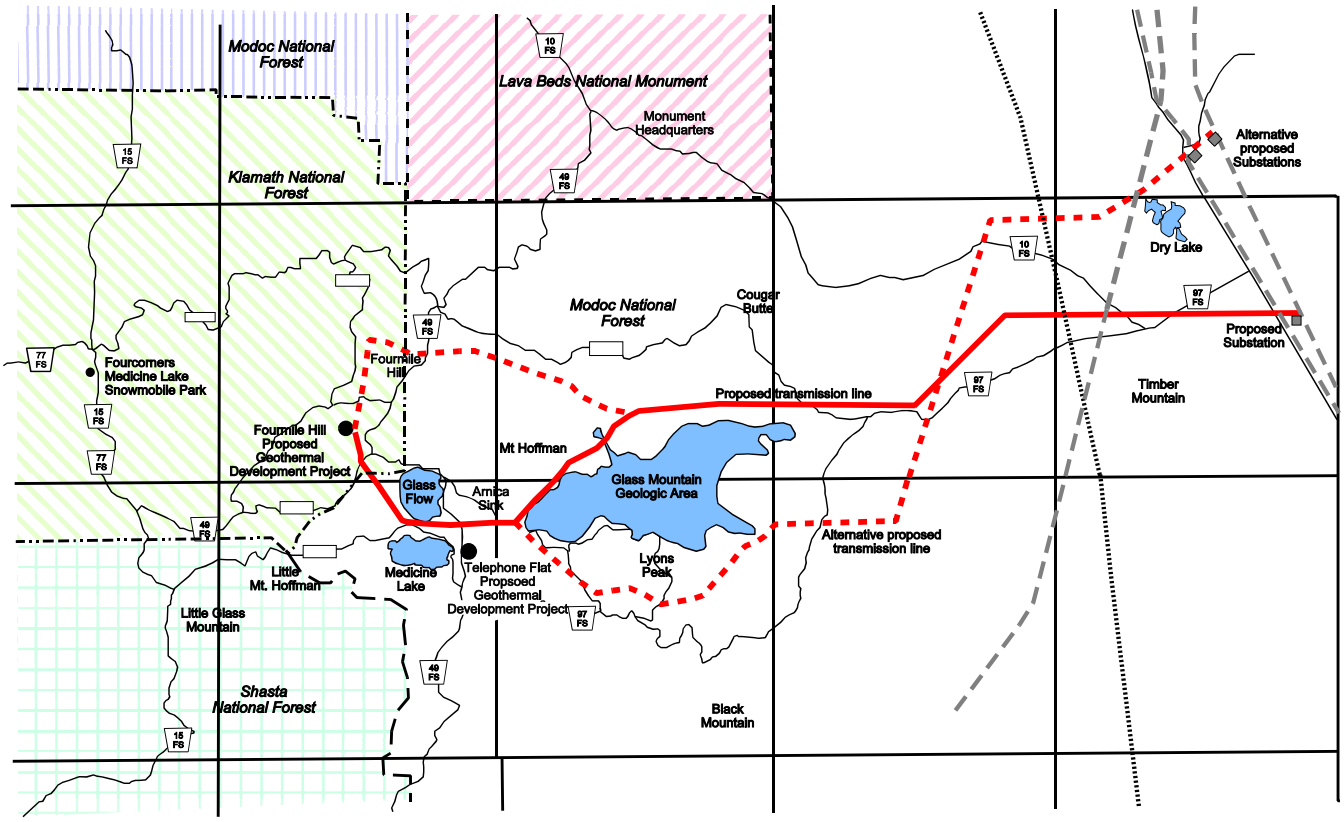
Optimization of Geothermal Drilling and Field Performance, Cerro Prieto Geothermal Field, Mexicali, B.C., Mexico, September 4-5, 1997. Contact GRC, PO Box 1350, Davis, CA 95617.

CALIFORNIA

Proposed Medicine Lake Power Plants Under EIS Review

Two geothermal power plants are being proposed for the Medicine Lake/Glass Mountain area in northern Siskiyou County. The Fourmile Hill Geothermal Project, being proposed by Calpine Corp., of San Jose, is outlined in a draft environmental impact statement now available for public comment. The plant, which would generate 49.9 MW will be located on Klamath National Forest land. The BLM and Forest Service will accept public comments on the proposed project through September 16th, and public hearings have been scheduled in Dorris, Yreka and Klamath Falls. A decision on whether to allow construction could come later this year, with well drilling to begin next year. If tests confirm the viability of the geothermal resource, construction of the power plant could being in 1999 or 2000. The plant would have an expected life span of 45 years, and would be dismantled after being decommissioned. Construction of the power plant would involve disturbance of 388.5 acres of land, including 335.8 acres for the transmission line right-of-way and access roads. The power plant would occupy a 10-acre site; while, seven well pads would require disturbance of 18 acres. About 25 acres would be disturbed by pipelines, roads and construction of a new substation. A 230-kilovolt transmission line would tie into a BPA transmission line to the east (see map on next page). Even though BPA has canceled a contract to buy power from the facility, Calpine Corp. spokesperson says it hopes to market the power, which results in very low emissions of air pollution, as environmentally-friendly "green energy."

Employment during the construction of the plant would increase from about 15 construction workers in the first year to 160 at the peak of construction, expected in the third year. Calpine estimate the plant would be staffed by 19 permanent employees, with an annual payroll of $1.2 million. The company would pay an estimated $1.3 million in property taxes annually during the first five years of operation, with



payments declining gradually as the plant ages. Another $15 - $25 million in royalties would be paid to the federal government, which would return half the money to the state of California. Of the state's share, 40 percent would be distributed to the counties where the power plant and transmission lines are located.

A second proposed project, also just under 50 MW, will be constructed by CalEnergy Co., of Omaha, Nebraska. The Telephone Flat proposal is about six months behind the CalEnergy project; thus, the draft EIS report will not be available for public comment until later this year. This plant, also a double-flash steam power generating facility, will be constructed on the other side of Medicine Lake. The power will be transmitted by a connection to the Calpine power line (see map). (Todd Kepple - *Herald and News*, July 18, 1997)

OREGON

BPA Pays Nearly $175 Million

The Bonneville Power Administration has agreed to pay nearly $175 million from ratepayers to back out of energy generation projects since 1995. The total includes $30 million in confidential settlements that Bonneville made in December with two California companies who had agreed to build geothermal plants on the federal agency's behalf. In one case, BPA paid $12 million to withdraw from a geothermal project without informing its partner, the city of Springfield's utility, that is was abandoning the deal, court records show. The Springfield Utility Board has since gone to court to challenge BPA's action and make public the still-secret settlement that BPA signed. Bonneville Administrator Randy Hardy said that projections of growth beyond what BPA could generate had prodded the agency to take on these deals a few years ago. It would cost Bonneville more to stay in those projects than get out, he said. "To continue with these projects would have been to endure economic hardship for northwest ratepayers," Hardy said. Jeff King, an energy resource analyst with the Northwest Power Planning Council, said Bonneville's assessment might be correct. "Bonneville might find it needs these power resources for the long term; but, the answer from a business point of view may be that it needs to survive in the short term to do anything at all in the long term," King said. One of the geothermal projects that BPA is buying out of is near Vale in Malheur County, which was a joint project with the Springfield Utility Board. When test wells at the Vale Site failed to find enough steam to run the plant, the original developer sold its interest to Calpine Corp. of San Jose, CA. Calpine chose to move the project to Glass Mountain (Medicine Lake) in northern California, which is still within BPA's marketing area. In December, BPA ended its commitment to this facility at a cost of $12 million.

The second geothermal project was proposed for Newberry Crater in Deschutes County, near Bend, OR. CalEnergy Co. of Omaha, Nebraska, had proposed a 30-MW plant at this site. BPA would buy two-thirds of the plant's power and subsidize the purchase of the remaining power for the Eugene Water and Electric Board (EWEB). In August

1996, CalEnergy claimed that its test well at Newberry showed the site didn't produce enough steam. As with the Calpine deal, CalEnergy had the right to move the project to Glass Mountain in California and BPA was obligated to buy the power. Bonneville, however, balked at staying in the deal, and thus, are proposing to pay $9 million to get out at a future date and an additional $9 million if it chooses not to buy the power. (Brent Walth - *Oregonian*, May 18, 1997)

Geothermal Hookup for New County Building

The new Klamath County Courthouse and administration building may be heated by geothermal. The original building, damaged beyond repair in the magnitude 6.0 earthquake in 1993, is being torn down to make way for the new $17-million building. The county is presently deciding if they should hook on to the city of Klamath Falls' geothermal district heating system. This system, supplying 180°F water to the downtown area, provides heat for a number of other governmental buildings and for sidewalk snow melting. The final design should be completed this summer and construction starting shortly afterwards.

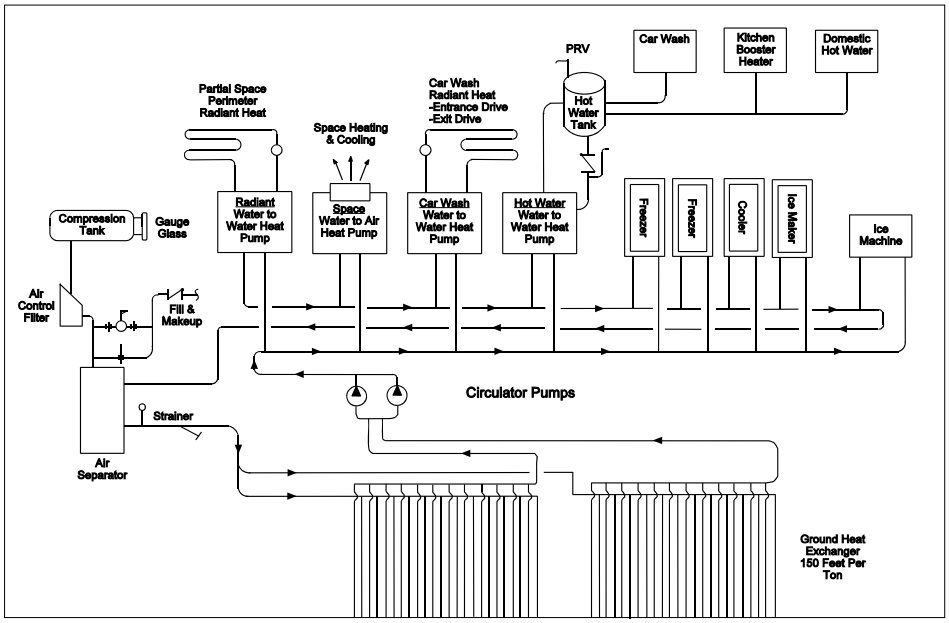
Australian Red Claw Crayfish Farm

AquaFarms, owned by James G. Lewis and his partner, will soon raise Australian red claw crayfish on 20 acres just west of Hunter's Hot Springs and Family Resort in Lakeview. Ground breaking was in May. Plans call for a dozen raceways to be built over the next three years. Each raceway will measure 370 feet in length and 16 feet in width, enough space to raise more than 100,000 crayfish--with an annual production of almost 1.25 million crayfish. Each raceway will be housed inside a greenhouse with extra space dedicated to a still undetermined medicinal cash crop. Inside each greenhouse will be two tanks. One tank is for the brood stock. The other one is for brine shrimp, the crayfish's chief food source. The shrimp are 60 percent protein, which accelerates growth. Mr. Lewis estimates he'll need to raise 15 tons (at 6,000 shrimp to the pound) over the next eight months to meet the crayfish's demands. Other potential markets include the Philippines and other Pacific Rim countries. Geothermal water in the area is around 200°F, with a minimum of 70°F needed for the crayfish to survive. (Source: *Herald and News*, June 22, 1997)

MINNESOTA

Heat Pump Installation for Gas Station/Convenience Store

A ground-coupled heat pump system has been installed in a Conoco/Petro Plus gas station and convenience store in Sandstone. The installation is expected to save about 25% ($5,000) of the typical annual energy cost of space heating and cooling, and water heating. The geothermal system has a simple-payback of between four and six years, according to Minnesota Power. The 4,300-sq-ft store will use three heat pump with ground loops of 24, 150-ft deep wells dug 20 feet apart (150 ft per ton of capacity)(see figure below). The integrated geothermal system uses a piping arrangement that circulates water through two water heating heat pumps, one space heating and cooling heat pump for the store area, a walk-in cooler, two freezers, ice machine, and the earth heat exchangers. The loop system is a heat source for the car wash water heating, domestic water heating, radiant heating in the car wash floor, and snow melting under the car wash's entrance and exit areas. The waste heat from the refrigeration units supplements the 22-ton (77.4 kW) system's output with 75,000 Btu per hour to the loop. The mechanical contractor is Gary Drilling. (Source: *ASHRAE Journal*, June 1997)



Schematic of integrated geothermal system.

PENNSYLVANIA

Heat Pump Installation for a Nursing Home

One hundred and twenty wells will be dug in the site of the new 360-bed Neshaminy Manor in Doylestown Township. The wells will extend to a depth of 479 feet to tap a constant ground temperature of 54ºF. A ground-source heat pump (GSHP) will be installed to control the climate in the new nursing home. The 160,000-sq ft building will use the earth for heating and cooling with a 20-year savings of $3 million. The system is designed by Energy Performance System, Inc. To install a boiler system would cost $3.8 million, with a cost of $227,000 annually to operate and $71,000 to maintain. The geothermal system will cost about $3.7 million to install, but $143,000 to operate each year and $33,000 to maintain--providing the $3 million savings. The total building cost is $19.5 million. (Source: *Allentown Morning Call*, June 9, 1997)

CHINA

An underground "pool" of hot water with more than 220 billion cubic meters of geothermal reserves has been found under Tianjin in north China. The 8,700-sq-km "pool" makes the city the largest of the medium- and low-temperature geothermal resource-rich regions in China. The reserves lie from 60 to 3,000 meters deep, and have high mineral contents, moderate temperatures, and are suitable for daily use. More than 100 million yuan ($12 million) has been spent verifying the reserves since the 1970s. The city has drilled 150 wells and has extracted 15 million cubic meters of hot water annually. The three near-surface geothermal "pools" alone provide enough water for central heating for three million square meters of residences. Another result has been that the Tanggu District was able to shut down 581 boilers and more than 500 chimneys. More than 100,000 people use the geothermal water in their daily lives. Tianjin has expanded the use of the geothermal heat from industry and central heating to greenhouses, aquatic products, therapeutic purposes, mineral water development, and scientific research. The city has adopted some regulations to protect and maintain these resources. (Source: *Xinhua English Newswire*, June 18, 1997).