GEOTHERMAL PIPELINE

Progress and Development Update
from the Geothermal Progress Monitor

CALIFORNIA

Northern California Power Agency Approves Project to Convert Waste Water to Geothermal Energy

On 27 July 1995, the Northern California Power Agency (NCPA) Commission formally approved participation in the Southeast Geysers Effluent Pipeline Project (Project). The Project involves construction of a pipeline to deliver treated sewage effluent from Lake County to NCPA's Geysers geothermal generating facility for deep injection into the hot geothermal reservoir.

Michael McDonald, NCPA's general manager, said "the Project will provide a good source of injection water to sustain geothermal electrical generation into the next century while solving wastewater disposal problems for the city of Clear Lake and other residents of Lake County." Action by the NCPA Commission follows closely on the heels of recent approval by the Lake County Board of Supervisors of all agreements necessary to construct the pipeline, including all environmental documents. The project has been in the planning for more than 3 years and involves NCPA, Lake County, and all of the operators in the Southeast Geysers geothermal field, including Unocal Corporation (Unocal), Calpine Corporation (Calpine), and Pacific Gas & Electric CO. (PG&E). Additional injection water via the pipeline is expected to extend by at least 15 years the useful life of NCPA's existing 200 MW power generation facilities at The Geyser, located in Lake and Sonoma counties. Extending the useful life of NCPA's existing geothermal power facilities will allow the NCPA better to serve the future electrical needs of its member utilities.

Total construction costs of the main pipeline and pumping facilities are estimated at approximately $34.1 million. Ground breaking is scheduled in late September 1995, with completion expected by December 1996. The project's innovative public/private cost-shared financing plan includes Lake County wastewater funds; federal grants from the Department of Energy, Environmental Protection Agency, Bureau of Land Management, and the Economic Development Administration; a grant from the State of California (California Energy Commission); and equity investments by all geothermal operators (NCPA, Unocal, Calpine and PG&E) totaling $21.5 million.

NCPA estimates that the project will result in a gain of approximately 40 MW in electrical power output. Over the next 20 years, this will equate to an annual delivery of 350,000,000 kWh of clean, low-cost and renewable electrical generation. Beside the project's obvious energy benefits to NCPA and its partners, the project will provide an environmentally superior method of wastewater disposal, while providing added tax, lease and royalty revenues to local communities, the state of California, and the federal government. (Source: GRC Bulletin)

HAWAII

Two-Year Anniversary in Hawaii

The Puna Geothermal Venture's (PGV) Pohoiki power plant is 2 years old. Over this period, it has produced an average of 25 MW of power--about a fifth of the county's electrical load. The operator of the plant PGV--which is a partnership between Constellation Energy Inc., a subsidiary of Baltimore Gas & Electric Co. and OSI Power Corporation--has stated that the power plant can produce 30 MW of electrical power. PGV is now in the progress of negotiating with Helco, the local utility, to sell the extra 5 MW.

It has been estimated that a conventional power plant operating on oil would have burned about 800,000 barrels of oil--about eight tanker loads during the 2-year period.

PGV would like to further develop the geothermal field and construct another power plant. It was noted that the resource is available and is indigenous, so money does not have to leave the island to pay for fuel to produce electrical power. (Source: GRC Bulletin)

New Hydrogen Sulfide Study in Hawaii

The Puna Malama Pano, an organization of Puna residents who are opposing geothermal energy, has received a $20,000 federal grant from the Environmental Protection Agency (EPA) to purchase the equipment and make a sustained test of the air around the PGV power plant. The organization believes that the monitoring equipment now being used is not properly set up to accurately monitor H_2S that is heavier than air.

The organization will monitor H_2S in the following manner:

- Set up the monitoring equipment in the low areas around the power plant.
- Shorten the length of the pick-up tubes so that they will receive air samples closer to the ground.
- Because H_2S sometimes moves like a stream of water, the monitoring stations
- will be at the most optimum sites to detect the gas.

The H_2S standards set by the state of Hawaii allow 25 parts per billion (ppb) from any facility. The PGV permit states that the air around the plant may not contain more than an average of 5 ppb per hour. This means that the air around the plant can register momentary surges of greater than 5 ppb, but the plant would still meet the state requirements as long as the average reading for an hour is below 5 ppb.

The standard set by the Occupational Safety and Health Administration (OSHA) is 10,000 ppb. This means that a healthy worker can be exposed to this level of H_2S for eight hours per day.

At 500,000 ppb, H_2S can cause immediate respiratory distress and paralysis, and can be fatal. (Source: GRC Bulletin)

MEXICO

Calpine Enters International Power Market; Company Initiates Program at Cerro Prieto Geothermal Resource

On 9 June 1995, the Calpine Corp. of San Jose, CA, announced that it had entered into a series of agreements with Grupo EPN S.A. de C.V. (Grupo EPN) and its affiliate, Perforadora Magma S.A. (Magma), to participate in geothermal steam production and well drilling, and repair projects at the Cerro Prieto geothermal resources in Baja California, Mexico. Representing the company's first international energy venture, the proposed projects will be under contract to Mexico's national utility, Comision Federal de Electricidad (CFE). The agreements were executed on 8 May 1995 at a ceremony held under the auspices of the U.S. Department of Energy in support of the Global Climate Change Initiative. The agreements were witnessed by Secretary of Energy Hazel O'Leary.

Grupo EPN, a Mexican resource development company, and Calpine have entered into a memorandum of understanding to produce approximately 1,600 tons per hour of geothermal steam at Cerro Prieto for CFE. Calpine also entered into a separate agreement with Magma for the drilling of 10 new geothermal wells to expand the capacity of the Cerro Prieto field and for the restoration of 20 of CFE's geothermal wells also at Cerro Prieto. The well drilling projects are managed in conjunction with two CFE contracts, totaling $26 million, which were awarded to Magma in 1995. The initial 10-well program began in early July. Calpine will provide funding for the projects as well as technical, administrative and operating services.

Consistent with its long-term strategy, the Cerro Prieto projects represent Calpine's first international venture. The company anticipates strengthening its relations with CFE and Grupo EPN to further develop geothermal opportunities at Cerro Prieto.

The Cerro Prieto geothermal resource, commercially developed since 1973, is located in the Mexicali Valley on the Baja California peninsula. The resources currently produces approximately 600 MW of electricity from three geothermal power plants. This production supplies nearly 70 percent of northern Baja California's electricity demand. (Source: GRC Bulletin)

NEVADA

Nevada School Bets on Geothermal to Win

The White Pine County High School in Ely, Nevada, only opened in February, but school officials are already betting its environmental system will save $25,500 annually in utility bills and operating costs.

The 82,000-sq-ft facility houses 550 students in a town 260 miles north of Las Vegas. Its indoor climate is controlled by a closed-loop heat exchanger made of nearly 78,000 ft of Phillips "Driscopipe" 5400 high-density polyethylene (HDPE) pipe produced by Phillips Driscopipe Inc., a subsidiary of Phillips Petroleum Co.

"One of the biggest hurdles faced by utilities and contractors promoting geothermal energy is the local community's fear of water table pollution," said Jim Lewis, acting manager, Mount Wheeler Power Co. He said the pipe was selected because of its resistance to cracking and leaking, as well as its longevity.

Desert Requirements

The town of Ely endures abrasive desert conditions, cold winter months and high altitudes. Temperatures plummet to -20°F, heating is often required for seven months each year. Conditions like that call for a strong pipe.

Glenn Messner, Phillips Driscopipe's new market development manager, said the pipe has been used in ground-source heat pump installations at Phillips 66 gas stations, where it averages $15,000 savings in reduced utility costs.

Inter Mountain Pipe Supply, Centerville, Utah, supplied the 72,000 ft of 1-in. pipe, 5200 ft of 3-in. pipe, 440 ft of 6-in. pipe, and 240 ft of 8-in. pipe used at the school.

The system was designed by Peterson Associates, Reno, in conjunction with Earth Energy Technology and Supply, Inc., Marietta, Oklahoma. Earth Energy provides a computer model for the heat exchanger and designed the heat fields.

"The rock, rock aggregate, and other potentially abrasive materials found throughout the site necessitated a strong pipe," said Phil Schoen, Earth Energy's director of marketing.

"We've used Driscopipe 5400 on other projects at schools and homes, and know the material has a strong resistance to abrasion. The pipe also is highly conductive which facilitates the extraction of heat from the soil."

Thermal Transfer

The pipe transfers heat exchanged between the heat pump and the ground. System fluid, water or water and antifreeze, is circulated through the buried pipe system, which absorbs heat from the earth and carries it to the heat pump.

At the high school, the heat pump extracts heat from the pipes, compresses it to a higher temperature, and distributes it to individual heating-cooling units in each classroom. The individual units enable each teacher to determine individual classroom temperatures.

Heat may be drawn from one classroom to a cooler one. Unneeded heat is returned to the earth via the piping network.

Construction

Christiansen Drilling, Ely, drilled 144 boreholes 250 ft deep and inserted U-shaped, closed-loop, 1-in. pipe filled with water. After insertion, the pipes were hooked to a pressure pump as a quality-control check-up to 100 psi.

The boreholes were then filled to the surface with bentonite grout, to bond the pipe to the hole walls and prevent air cavities from forming. The natural clay material seals the boreholes from bottom to top, to protect the integrity of the system and of nearby aquifers. It also provides a thermal bridge between the earth and the pipe.

O'Flaherty Plumbing & Heating excavated 5 ft down the borehole to butt-fuse the 1-in. well loop to a common 3-in. prefabricated manifold. The manifold leads to the valve vault,

where the piping was butt-fused to 6-in. pipe and a series of circuit setters and valve headers.

The System

The school's system has two heat loop fields, each consisting of six well clusters or zones. (A well cluster has 12 wells.) Interconnecting the wells into one cluster took the crew eight to 12 hours.

One 8-in. supply and return line coming from the school teed-off into two 6-in. ones, one for each heat loop field. The 6-in. lines fed to the valve vaults, where valve manifolds comprised of six valves and six circuit setters isolated each well cluster. (Valve vaults enable individual or group control of the clusters to monitor temperature and pressure.)

Benefits

Although the project involved a lot of work, all involved seem to think it worth the effort.

"Ground-source pumps cost more to install than conventional heating systems, but geothermal energy pays for itself in only a few years," Lewis said. "In two demonstration projects completed in Ely, electric bills were 78% less using geothermal energy."

The school's system was estimated to cost $340,000 more initially than a $423,000 conventional heating and cooling system. Officials estimated it would save more money in the long run. Mount Wheeler Power financed the project with a 12-year lease option.

"We offered financial assistance on this installation to prove to the community that geothermal energy works," Lewis said. "The school will save $25,000 in reduced heating costs each year, which calculates to nearly $800,000 savings during the projected 50-year life of the school." (Source: Engineered Systems)

PENNSYLVANIA

Two-Phase Geothermal Fluid Standard Developed

The chemical analysis of geothermal fluids is important to the maintenance and operation of geothermal wells and power plants.

And, although sampling of geothermal fluids is performed around the world, experts believe there has been no consensus standard developed, which ensures that consistent and reliable data is gathered from different sources.

According to Paul Hirtz, that will change.

Hirtz is chairman of a task group with the American Society for Testing and Materials (ASTM). His committee, Task Group E44.15.01 on Sampling and Chemical Analysis, has helped produce the society's Standard E 1675, "Practices for Sampling Two-Phase Geothermal Fluid for Purposes of Chemical Analyses."

According to ASTM, the purpose of the practice is to obtain representative samples of liquid and steam as they exist in a pipeline transporting two-phase geothermal fluids. The chemical composition data may be used for many applications important to geothermal energy exploration, development, and the long-term managed exploitation of geothermal resources, the association said.

According to ASTM, applications include resource evaluations, such as determining reservoir temperature and the origin of reservoir fluids, compatibility of produced fluids with production, power generation, and reinjection hardware exposed to the fluids, long-term reservoir monitoring during field exploitation, and environmental impact evaluations, including emissions testing.

The organization said the natural chemical produced in geothermal fluid can cause a number of problems, such as scale deposits and corrosion of the well-bore casing and production piping.

ASTM added that a significant feature of the practice is the use of a cyclone-type separator for high-efficiency phase separation, operated at flow rates high enough to prevent significant heat loss, while maintaining an internal pressure essentially the same as the pipeline pressure.

ASTM said Standard E 1675 is available from its customer service, 215-299-5585. For more information about E 1675, contact Hirtz, Thermochem Inc., 5347 Slylane Blvd., Santa Rosa, California 95403, 707-575-1310. (Source: Air-Conditioning, Heating & Refrigeration News)

VIRGINIA

Geothermal Teleconferences to be Broadcast

The sponsors of the natural geothermal heating and cooling teleconferences announced the 1995-96 continuation of the series developed in conjunction with the Geothermal Heat Pump Consortium.

In 1995 and 1996, there will be three teleconferences each year, every one focusing on a specific topic, type of building, or customer segment.

Dates and topics for 1995 are Sept. 14--"Geothermal Heat Pumps in Commercial Buildings", and Nov. 16--"Geothermal Heat Pumps for Residential Customers."

The two-hour teleconferences will provide information for audiences of commercial and residential designers, utility personnel, facility managers, users, realtors/developers, and others interested in the technology.

Downsite participants will be given the opportunity to telephone questions to GHP authorities, users, designers, and installers who will be in the teleconference studio.

For more information, contact the Conference Coordinator, Policy Research Associates, Inc., 703-742-8402, 703-742-8671 (fax).

Topics for the 1996 teleconferences will be, spring--"Multi-Family Residential Buildings", early fall--"Small Office Buildings", late fall - "Retail Buildings."

The teleconferences will be broadcast via satellite from 10:30 a.m. to 1 p.m. eastern time (10:30 to 11 a.m. is the test pattern).

Major sponsors include the U.S. Department of Energy, U.S. Environmental Protection Agency, Electric Power Research Institute, Geothermal Heat Pump Consortium, International Ground Source Heat Pump Association, National Rural Electric Cooperative Association and Edison Electric Institute. (Source: Air-Conditioning, Heating & Refrigeration News)