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GEOTHERMAL HOT LINE

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Biologist Gary Tompkins checks the moisture in sugar beets that have been watered with salty geothermal brine. With his indoor geothermal garden at the Lawrence Livermore Laboratory, Tompkins wants to find out which chemicals in the brine are taken up by plants and how the brine affects their growth.

SUGAR BEETS AND TOMATOES GROWN IN BRINE

Growing sugar beets and tomatoes (var. Rutger) in geothermal brine solutions is a research project, almost completed, by Gary Tompkins at Lawrence Livermore Laboratory. Tompkins watered the sugar beets and tomatoes with brine solutions of 25,000 ppm, 2,500 ppm, and 250 ppm of total dissolved salts. The brine was obtained from the Salton Sea area of the Imperial Valley.

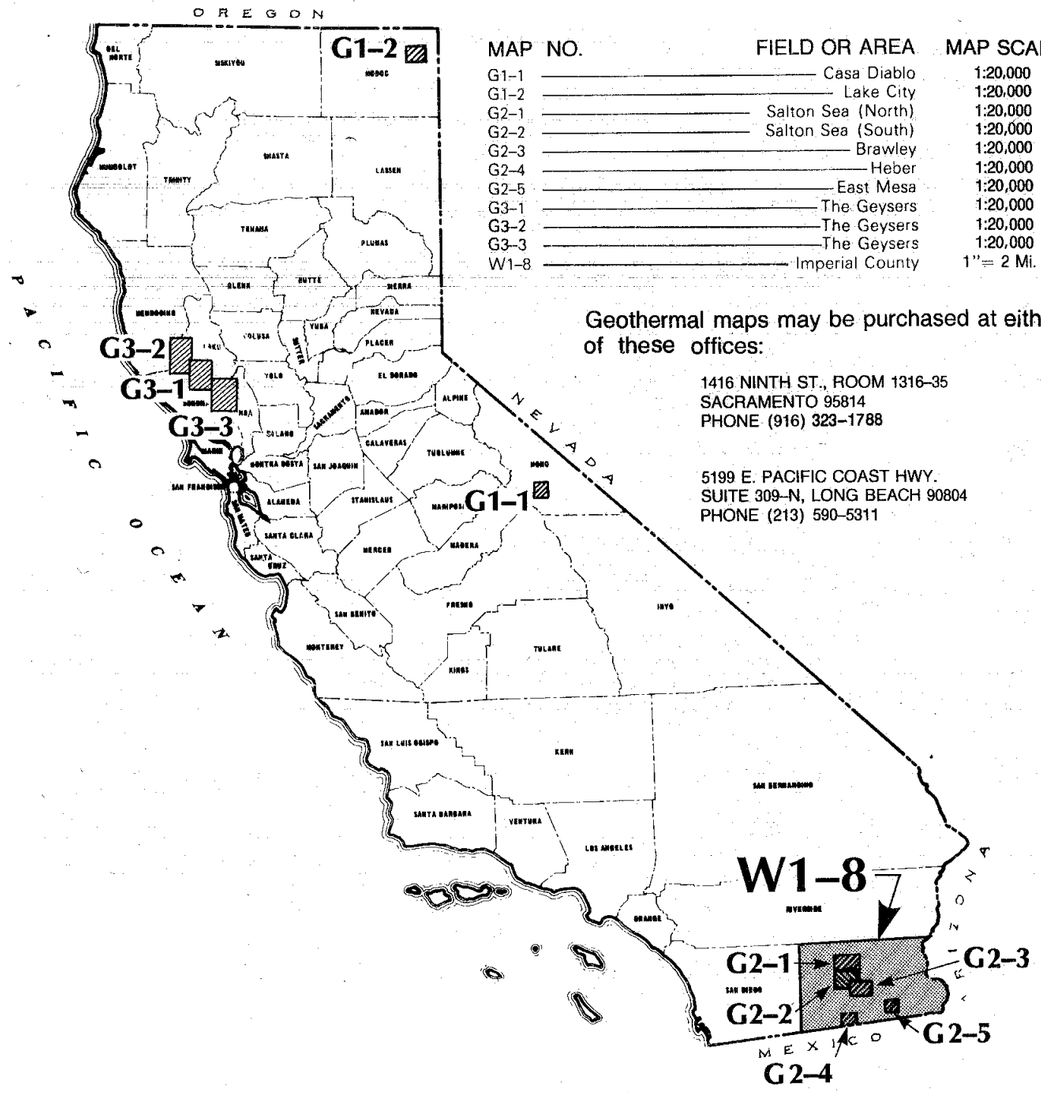
Although it is highly unlikely that geothermal brines would enter irrigation water in the Imperial Valley, Tompkins studied what effects they might have on crops if this should occur. He chose the 25,000 ppm solution as an extreme concentration he knew would damage the crops. This concentration represents a 10 percent solution of

Continued on page 4.

California Division of Oil and Gas

GEOTHERMAL MAPS

ALL MAPS ARE AVAILABLE AT A COST OF $3.00 PER COPY.



MAP NO.	FIELD OR AREA	MAP SCALE
G1–1	Casa Diablo	1:20,000
G1–2	Lake City	1:20,000
G2–1	Salton Sea (North)	1:20,000
G2–2	Salton Sea (South)	1:20,000
G2–3	Brawley	1:20,000
G2–4	Heber	1:20,000
G2–5	East Mesa	1:20,000
G3–1	The Geysers	1:20,000
G3–2	The Geysers	1:20,000
G3–3	The Geysers	1:20,000
W1–8	Imperial County	1"= 2 Mi.

Geothermal maps may be purchased at either of these offices:

1416 NINTH ST., ROOM 1316–35
SACRAMENTO 95814
PHONE (916) 323–1788

5199 E. PACIFIC COAST HWY.
SUITE 309–N, LONG BEACH 90804
PHONE (213) 590–5311

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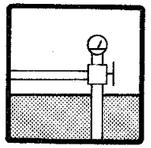


Imperial Valley

Continued from page 1.

the 250,000 ppm geothermal brines in the Salton Sea area.

Sugar beets and tomatoes watered with 25,000 ppm brine had slightly elevated levels of selenium and total strontium. Potassium uptake decreased in an expected manner. The yield of both crops decreased by about 30 percent.

Crop reduction has not yet been calculated for sugar beets and tomatoes watered with a 2,500 ppm concentration. From preliminary results now in for sugar beets and tomatoes watered with a 250 ppm concentration, Tompkins anticipates that no negative effects will be found.

A final project report will be published by Lawrence Livermore Laboratory.

Vegetation Irrigated with Brackish Water

How irrigation with 2,000 ppm brackish water affects the growth and development of vegetation is being investigated in El Centro, CA by Dr. Frank Robinson of the University of California, Davis. With brackish water pumped from a natural reservoir, Dr. Robinson is raising native (climax) vegetation and trees, and plans to raise crops.

When geothermal well sites are prepared in the Imperial Valley, native vegetation is cleared away. This vegetation includes creosote bushes and many annuals. Dr. Robinson has found that native vegetation replanted at former drilling sites thrives on irrigation water pumped from the brackish reservoir.

Tamarisk trees are used as wind breaks near Indio, CA. Dr. Robinson is growing tamarisk trees in the brackish water and says they are doing well. Also, he is raising pine tree- and date palm-seedlings, now one year old. The seedlings are surviving, but it is too early to know what the long-term effects of the brackish water will be upon them.

In mid-September, Dr. Robinson plans to plant asparagus, alfalfa, and sugar beets that will be irrigated with the brackish water.

The water used in these experiments is not nearly as brackish as many geothermal brines in the Imperial Valley. However, research into the capabilities of all types of brackish water to sustain vegetation is important.

Growing Algae in East Mesa Fluids

Republic Geothermal has proposed expanding to two hectares an East Mesa experimental facility to evaluate the feasibility of growing commercial algae in geothermal fluids, according to a USGS memorandum. The company wishes to evaluate the potential of using East Mesa geothermal resources to culture a blue-green alga, Spirulina sp., as a high protein food source. The algae would be grown in shallow ponds under various physical and nutritional conditions. Conditions that optimize algal growth rate and nutritional qualities would be identified from these experiments.

Imperial Valley Wells Planned

Westmorland Geothermal Associates, funded in part by a DOE-backed $29 million loan from the Bank of America, will drill 19 geothermal wells in California's Imperial Valley.

The wells, located near Westmoreland, CA, are expected to produce enough geothermal energy to generate 55 MWe.

DOE's San Francisco Operations Office negotiated the Westmorland agreement and will administer it. The $29 million loan will cover a 48-month period. Total cost of the Westmorland project is estimated at $40 million.

The loan is authorized under the Geothermal Energy Research, Development, and Demonstration Act of 1974 that established a Geothermal Resources Development Fund, now totaling $300 million. Thus far, DOE has approved loan guarantees and commitments totaling nearly $75 million.

Niland Facility Tests New System

A new system designed to reduce clogging of geothermal injection wells is being tested at The Niland Geothermal Loop Experimental Facility (GLEF). The new clarifier-filter system is described by William Jacobson, plant engineering supervisor, as one designed to remove mineral material from spent geothermal fluid before it is injected in the geothermal reservoir. This is important because once the geothermal fluid gives up some heat while passing through the power plant, some salts in the fluid come out of solution.

At Niland, geothermal fluid contains more than 25 percent dissolved minerals and salts. Scale accumulation in pipes and valves, and interstitial clogging of the geothermal reservoir are some of the most significant problems the facility has experienced.

GLEF was opened in 1976 as a joint project of the San Diego Gas and Electric Company and the Department of Energy. Since that time, extensive tests have been made to determine the feasibility of using geothermal fluids at Niland to generate electricity.

The Geysers Area

Lake County EIR's Issued and Projects Approved

The first two environmental impact reports (EIR's) for geothermal exploratory projects ever produced by the California Division of Oil and Gas have been formally certified and approved by the division at the division hearings in Lake County on September 7, 1979. The EIR's were prepared for Occidental Geothermal, Inc. and Republic Geothermal, Inc. for the Sulfur Mound Mine Geothermal Prospect and Wildcat Geothermal Prospect.

Preparation of geothermal exploratory project EIR's and project approvals or disapprovals are duties mandated to the division by AB 2644 and the California Environmental Quality Act (CEQA). These duties, under law, must be handled within 135 days. The Lake County projects required 129 days, but future projects will be processed more rapidly.

Information on EIR's for geothermal exploratory projects in California is available from Rik Nevis, Geothermal CEQA Unit Supervisor, 1416 9th Street, Rm. 1316-35, Sacramento 95814, (916) 323-2733.

Wildcat Near The Geysers

A 10,762 ft. wildcat geothermal well is scheduled to be drilled in Mendocino County in Northern California by Sunoco Energy Development of Dallas. The company hopes the well will extend The Geysers field into Mendocino County. The well site is 5 to 6 miles from active steam production wells in The Geysers. The company hopes to encounter the same steam-producing zones penetrated at The Geysers.

Winterizing at The Geysers

With winter rains not far away, geothermal operators and Division of Oil and Gas engineers are checking drainage systems at the well sites in The Geysers Geothermal field. Brush and debris are being cleaned out of the drainage pipes and drainage systems around well pads are being put into top condition.

Although in October and November operators will reseed some cleared areas, some rains could fall before this occurs. For this reason, the pre-season checks are underway.

Sacramento Utility Plans Power Plant

The Sacramento Municipal Utility District (SMUD) plans to build a 55 MW electric generating plant at The Geysers Geothermal field. Stone and Webster Engineering, Boston, will design and manage construction of the proposed facility in Sonoma County.

Aminoil USA, a subsidiary of R. J. Reynolds Industries, will supply steam to the facility from wells drilled on a 40-acre federal lease around the plant site. Two successful shut-in wells have been drilled on the lease, 2 wells are scheduled for completion in 1980, and 4 are slated to be drilled in 1982 and 1983. Drilling costs are estimated at $1 million per well.

The Geysers Heat Source

Excerpted by permission from the October 1979 issue of California Geology, published by the California Division of Mines and Geology.

A wedge-shaped body of molten magma beneath The Geysers-Clear Lake area in California appears to be the heat source for the area's geothermal system. The presence of this magma chamber under Mt. Hannah was first suspected in 1966 by Rodger H. Chapman, a California Division of Mines and Geology (CDMG) geophysicist when a gravity survey map showed a low-density mass centered beneath the mountain (Mineral Information Service, September 1966, p. 148-149).

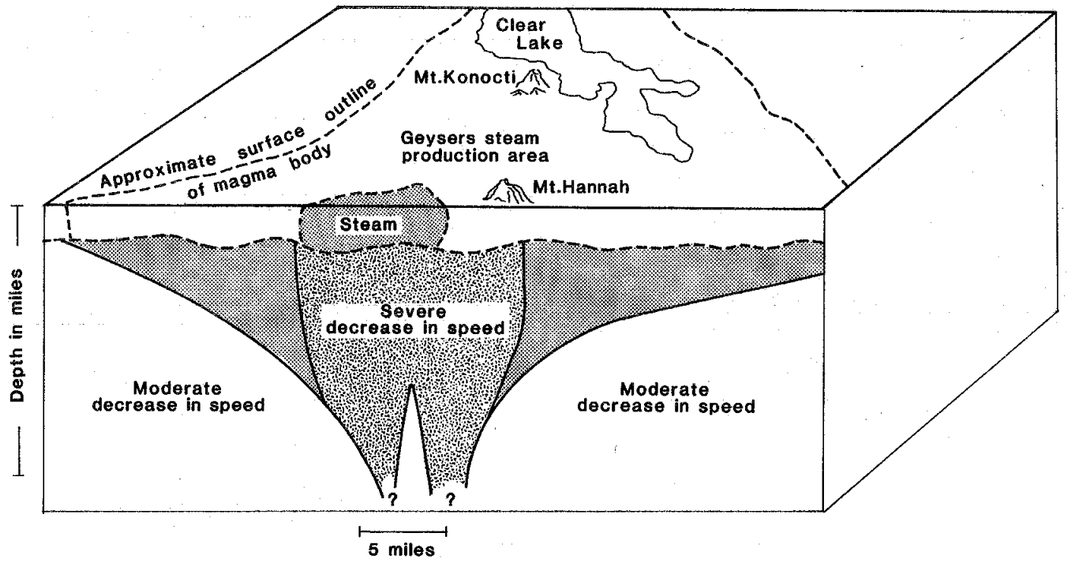
Following this study, additional geophysical studies in The Geysers-Clear Lake area by the CDMG (Special Report 116, Geophysical study of the Clear Lake Region, California) and the U.S. Geological Survey (USGS), (Science, May 1979), provided more evidence that indicated the presence of a magma chamber.

By studying seismic waves from distant earthquakes that travel through the chamber, USGS scientists H. M. Iyer, D. H. Oppenheimer, and T. Hitchcock located and delineated a magma chamber of molten rock directly under Mt. Hannah in the area of The Geysers Geothermal field. The seismic waves (called teleseisms) were recorded by a dense network of permanent and portable seismographs.

The seismic waves that traveled under the steam-production zone at The Geysers (and the volcanic zone to the north and east of it) were found to have slowed down considerably and changed drastically in appearance. Computer-modeling techniques were used to show that the seismic waves were slowed down on an average of 15 percent under a 1,000 square-kilometer area (about 380 square miles) comprising The Geysers steam-production zone and the Clear Lake volcanic field.

The slowing down of seismic waves was even more dramatic-25 percent or more-under Mt. Hannah and the Geysers Geothermal field. It is known that hot, partially molten rock can slow down seismic waves. Recent studies also have shown that fractured rocks with pore spaces filled with steam-as could be expected under The Geysers-can slow down seismic waves significantly. Therefore, it was concluded that the seismic waves are slowed under the volcanic field by a large body of partially molten rock, and under the geothermal production zone by a highly fractured steam reservoir underlain by magma.

Depth to the top of the magma may be about 4 kilometers (about 3 miles) below The Geysers Geothermal field. The approximate thickness of the low-speed zone is about 15-20 kilometers (about 9-12 miles). Detailed studies will be needed to determine more accurately the size and velocity structure inside the magmatic body and to make a complete model of the geothermal system at The Geysers.



Cross-section through The Geysers steam-production area and the Clear Lake volcanic field, showing a tentative model of the body that slows down seismic waves dramatically. The core region (heavily shaded) under Mt. Hannah, where wave speeds decrease by as much as 25 percent, may indicate the presence of intensely hot rocks in a highly molten state (magma). Under the steam-production zone, the effects of both the steam-reservoir and the magma may contribute to the low seismic speeds. Cross-section courtesy of the USGS.

Drilling to Magma

"Magma is the motherlode for all these geothermal sources" according to John Colp, a Sandia Corporation engineer heading a $1 million Department of Energy research program to explore ways of extracting energy directly from shallow deposits of molten rock. Colp is looking at The Geysers Geothermal field with the idea of drilling into the magma underlying the field. For Colp's project, after the molten magma is encountered, special heat exchanges would be installed and water poured in from the surface. The water would boil into steam and return to the surface to drive turbines. Colp says the proposal is "far out, 10 or 20 years from real application". Other California locations being considered for testing include Long Valley and Coso Hot Springs.

Formation of a man-made volcano once the magma was drilled into, Colp calls a "remote possibility".

Magma erupted recently from a steam well drilled in Iceland. According to an article in the July 1979 issue of Scientific American, the well, Borehole 4, was drilled to a depth of 1,138 meters to reach a hot-water aquifer at the Námafjall Geothermal field in 1968. From 1968 to September 8, 1977, steam was produced from the well.

On September 8, with a steady roar, a column of molton rock shot 15 to 25 meters into the air. A large quantity of sparks and cinders were emitted from the column and the eruption lasted about a minute. For the following 10 to 20 minutes, the hole was quiescent. In the final eruptive phase, lasting for another minute, there were a series of emissions of glowing scoria (vesicular, rough lava). After this event, steam production began in the well once again.

Further details of this event are in a Nature article written by Gudrún

Larsen, Karl Grönvold, and Sigurdur Thorarinsson of the University of Iceland. These authors explain that the field is about 9 kilometers south of the Krafla caldera (volcanic crater), and that basaltic magma is fed continually into magma reservoirs lying about 3 kilometers below the caldera. Apparently, magma was injected that day into the well through a steeply-dipping fault. The fault intersects the well bore above the aquifer from which steam is produced.

Seismic Methods

Seismic Workshop Summarized

A detailed summary of a workshop on active and passive seismic methods applied to geothermal systems is printed in the August 1979 issue of Geotimes. The USGS-sponsored workshop, held to increase communication between seismologists working in an academic or governmental institution and those working in industry, took place October 1-5, 1978. The summary is written by Ronald W. Ward, workshop organizer.

Geologic models, rock properties, present status of methods, regional and prospect seismic studies, and problems and controversies are among the subjects covered in the summary. Ward feels that current geothermal exploration is at the same point where petroleum exploration stood at the turn of the century. He believes finding cost-effective seismic techniques will require the development and evaluation of both new and conventional seismic surveys.

Geopressured Resources

Geopressured Reservoirs Studied

The extraction and use of geopressured water and gas is the topic of a 1-year study by the Southwest Research Institute (SWRI). Researchers hope to determine how existing technology may be used to extract and utilize this energy to produce commercial electrical power.

Geopressured zones exist at depths of about 1500 to 7600 meters (5,000 to 25,000 ft.) along the Gulf coast of Texas and Louisiana. Similar zones are probably in other sedimentary basins of the world as well.

Possible Geopressured Well at Huntington Beach by Dick Thomas

In 1947, "Seguro" 1, perhaps California's first combination oil and geopressured-geothermal well, was drilled to 9,110 ft. in Huntington Beach oil field, near the city of Huntington Beach. The well was cased to 7,810 ft. During clean-out operations, hot water began to flow from below 8,400 ft. It is estimated that if this highly pressured, 450° F water had been allowed to flash at the surface, 210,000 lbs./day of steam would have been produced. An observer noted that,at times, hot water and steam blew over the top of the derrick crown.

In 1948, the operator, Seguro Petroleum Company, managed to plug off the lower portion of the hole between 8,626 and 5,657 ft. After three water shutoff failures between 5,756 and 5,352 ft. (and subsequent squeeze jobs), a water shutoff was finally approved at 5,111 ft. The well produced between 6 and 8 barrels of 13.5° API gravity oil and an equal amount of water during tests of the perforated interval between 5,127 and 5,352 ft. The amount was noncommercial.

Well History

"Seguro" 1, Sec. 34, T. 5S, R. 11W, S.B. B.&M., approximately 2,000 ft. northeast of the northwesterly-trending Newport-Inglewood fault, was drilled in an attempt to establish additional production below the prolific Jones sands of the Puente Formation (upper Miocene). The well was drilled routinely and cored to 9,110 ft. total depth. On February 11, 1948, following conditioning of the mud, electric logs were run.

Core records for the 5,105 to 9,110 ft. interval show severe fracturing in much of the brown shale and hard grey sandstone. Schist conglomerate and basalt (23 ft. of basalt was recovered between 6,860 and 6,902 ft.) appear to be much less fractured. Oil and gas shows are noted from most fractures and vugs. The presence of abundant slickensides indicates past rock displacements along fault planes. A decision was made to test the well for production.

On February 18, 1949, 7 in., 30 lb. casing was hung at 7,810 ft. in preparation for cementing. After an unsuccessful primary cementing job and three squeeze cementing jobs, the well was finally ready for a water shutoff test through perforations at 7,800 ft. The test on March 2, 1948 was inconclusive, and the operator decided to drill out the cement. The following well history is quoted from material on file at the division's Long Beach office.

"

3/7/48 Went thru the cement bridge, upon which the 7" casing had been cemented, at 7,856'. Well threatened to blow out with bit at 8,358' showing oily, gas cut mud then cement foam and yellow rotary mud - mud weight dropped from 85# to 60# (water).

3/8/48 Finished cleaning out to 9,110' - well started to flow hot water and could not get out of hole until killing it with 92# mud which came around at 76#.

Note: Each time the well flowed, it first showed considerable oil and gas before the hot water appeared, indicating that the water source was toward the bottom of the hole. Did not get D.P. (drill pipe) out of the hole until March 10th.

3/11/48 Ran Dale Temperature Survey as water witch. The water was so hot that it shorted the instrument out by melting the solder at 8,500' and subsequent try showed that the photographic film was completely destroyed at 2,500'.

3/12/48 Lo-Kate-It Temp. Survey was not able to get below 5,800' where the solder melted and line insulation was damaged by the high temperature.

3/13/48 to 3/16/48 Repeated efforts were made by Eastman Temperature Survey to locate the point of entry and maximum temperature of the water. Their solder and line insulation met the same fate as the other surveys. However, they did obtain a maximum temperature of 425°F. at 8,340' and 260°F. at the surface, before the instrument was destroyed. The temperature gradient projected to 9,110' would have been in excess of 550°F. During this period the well was flowing hot water and live steam with some oil and gas at the rate of 2,800 to 3,000 barrels per day. Subsequent killing and cementing operations were extremely hazardous due to the danger of scalding the men...."

At this point, the operator placed cement plugs at intervals between 8,626 and 5,365 ft., and tested the oil zone as described previously.

Development

Geothermal Energy Assessment

Geothermal "hot spots" able to yield the energy equivalent of 1.2 trillion barrels of oil are untapped under lands in western areas of the U.S. and parts of the Gulf Coast, according to a report in U.S. Geological Survey (USGS) Circular 790.

As part of its second national assessment of geothermal resources, geologists from the USGS said that the upper six miles of the earth's crust contain about 32,000 billion - billion (32 followed by 21 zeros) Btu's of heat energy. About 6.4 billion - billion Btu's can be harnessed by man "under reasonable assumptions of improvements in technology and economics".

"Geothermal energy is clearly coming of age, as demonstrated by the rise in growth rate of geothermal electrical generating capacity worldwide ," from 7 percent in the late 1940's to 16 percent in the 1970's, the report said.

6 "Most Promising" Fields are in Calif.

The most promising high-temperature geothermal fields in the Western U.S., excluding The Geysers Geothermal field, are described in a paper that was presented at the Geothermal Resources Council (GRC) Special Short Course No. 8 in May 1979 by David Anderson, Executive Director of the GRC.

Six California KGRA's are included in the list: Salton Sea, Westmorland Prospect (Salton Sea), Brawley, Heber, and East Mesa in the Imperial Valley, and Coso Hot Springs in the Mojave area. The five Nevada KGRA's mentioned are: Desert Peak Prospect (just north of the Brady-Hazen KGRA) in the Reno area, Steamboat Springs in Western Nevada, Dixie Valley in Central Nevada, and Humboldt House and Beowawe in the Battle Mountain area. The two KGRA's in Utah are Roosevelt Hot Springs and Cove Fort-Sulphurdale in the Milford area. One New Mexico KGRA was listed, Baca Location No. 1 (Valles Caldera) near Los Alamos.

Estimated total electrical potential for these fields is 12,684 MWe for 30 years. This estimate was taken from USGS Circular 790 (1978).

El Salvador Geothermal Production

Currently, 60 MWe are being produced from geothermal resources in El Salvador. Major geothermal development for the Central American country is at the Ahuachapan Geothermal Plant, 75 miles west of San Salvador, the capital city. There are 10 dormant volcanoes in El Salvador; one, Santa Ana, rises 7,500 feet above sea level at the Ahuachapan site.

To date, the site has two generating units. A third unit is planned for 1982. El Salvador not only produces the electricity for its own use, almost half of which comes from geothermal energy, but it exports electricity to its neighbor, Guatemala.

Hawaiian Geothermal Activity

A contract was signed by the Research Corporation of the University of Hawaii and the U.S. Department of Energy for installation of a 3 MWe wellhead generator at the HGP-A geothermal well in Puna, Island of Hawaii. The well was drilled to a depth of 6,140 feet in April 1976 by the University of Hawaii Geothermal Project. It is the world's hottest well, with a bottom hole temperature of 358°C (676°F). Design and completion of the project will take about two years.

Once the project is completed, the plant will run on an experimental basis for two years while environmental and reservoir data are collected. The economic feasibility of a small electric generator system will be assessed at this time.

The director of the Hawaii Institute of Geophysics estimated that the Kapoho Geothermal Reservoir, where the HGP-A well is located, may have a capacity of 500 MWe for 100 years.

Geothermal exploratory drilling in the Lualualei Valley on the island of Oahu has been recommended to representatives of the Department of Energy by scientists working at the Hawaii Institute of Geophysics, University of Hawaii at Manoa. Other Hawaiian islands considered to have geothermal development possibilities are Maui and Hawaii.

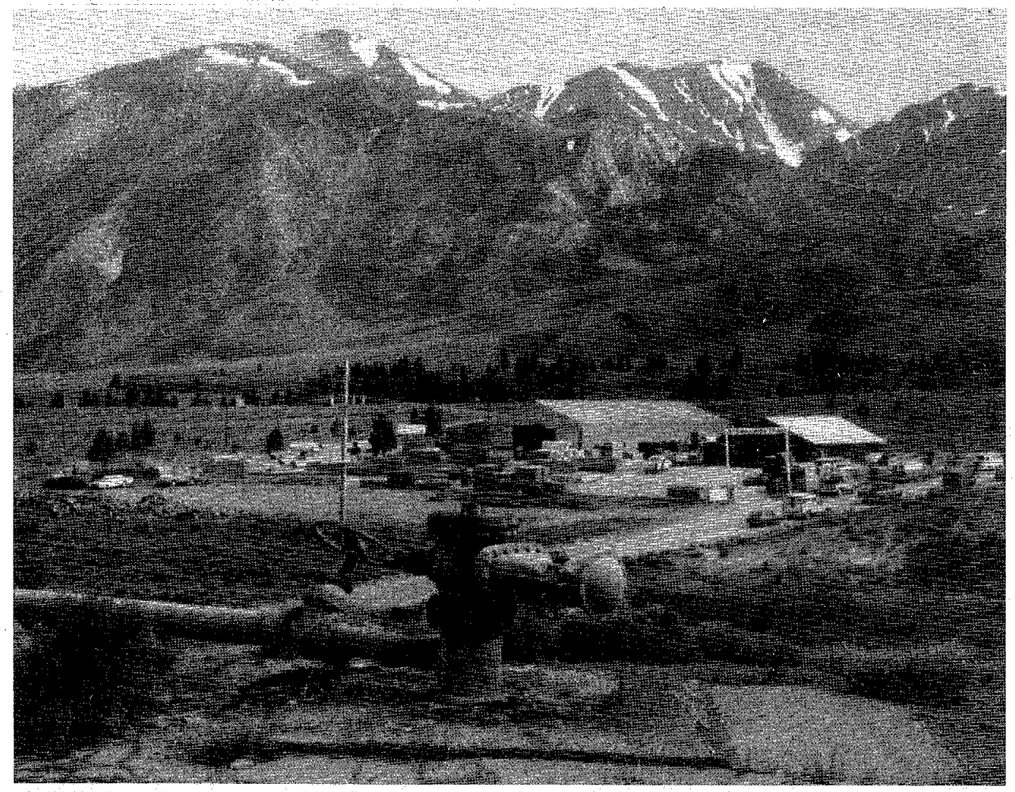
Mammoth Lakes Project Successful

by Melissa Jones, California Energy Commission

Geologists with the United States Geological Survey estimate that heat from the Casa Diablo Geothermal field could handle space heating and snow melting demands of the residents of Mammoth Lakes, California for 200 years. Mammoth Lakes is a ski and vacation area in the eastern Sierra Nevada range near Bishop, and Casa Diablo Geothermal field is about three miles from Mammoth Lakes.

To demonstrate how geothermal fluids can meet space heating and snow melting demands, a pilot project was undertaken and completed at Wickes Home Lumber and Supply Company, ¼ mile east of the intersection of U.S. Highway 395 and State Highway 203, near Mammoth Lakes.

In this project, geothermal fluids with a temperature of 165°C(330°F) were 1) pumped from a well drilled in the Casa Diablo Geothermal Reservoir,



Wickes Home Lumber and Supply Company, site of a geothermal space-heating demonstration project. Sierra Nevada range is in the background, and a geothermal well unrelated to the project is in the foreground. Photos for this article by Dick Thomas.

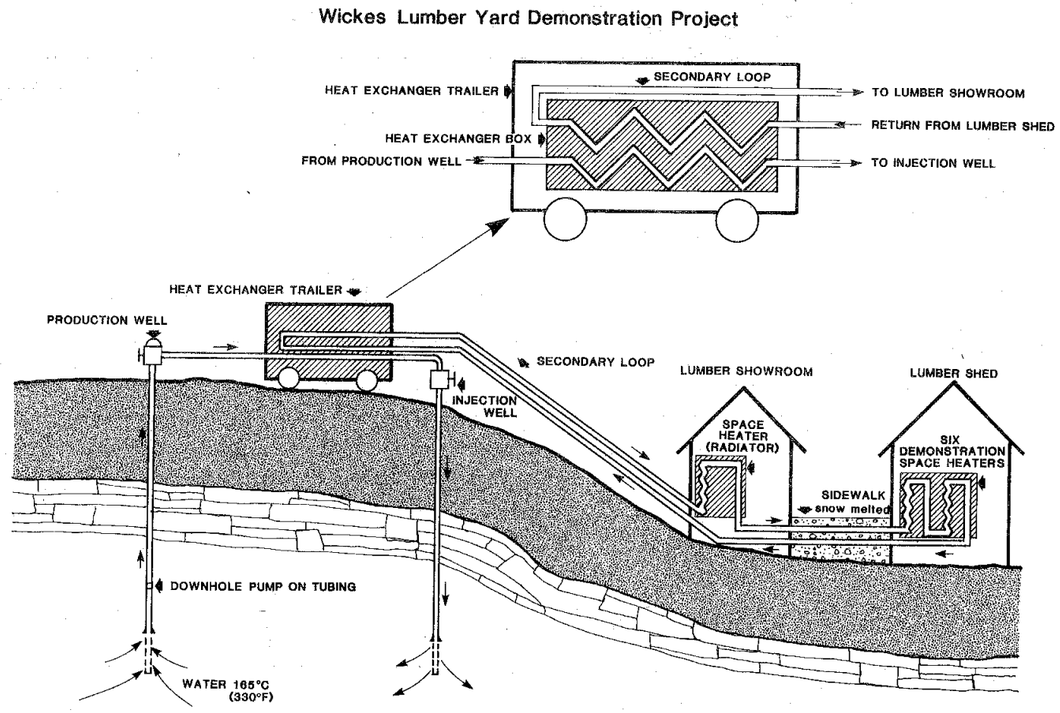
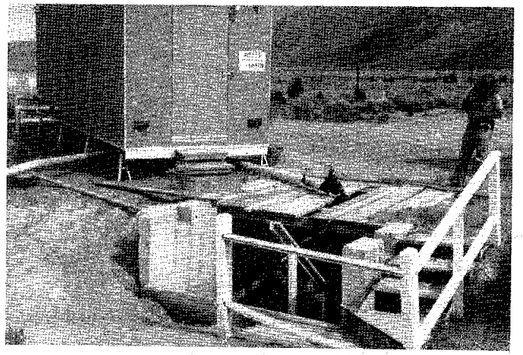
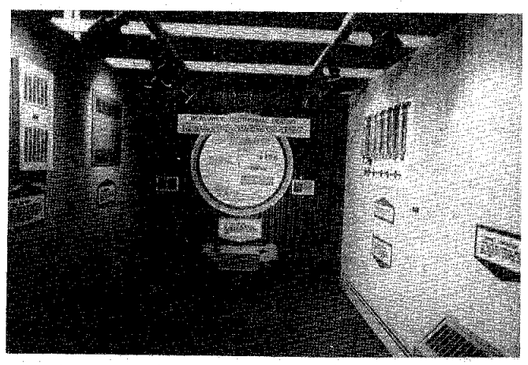


Diagram of the space-heating and snow melting demonstration project at Wickes Home Lumber and Supply Company.

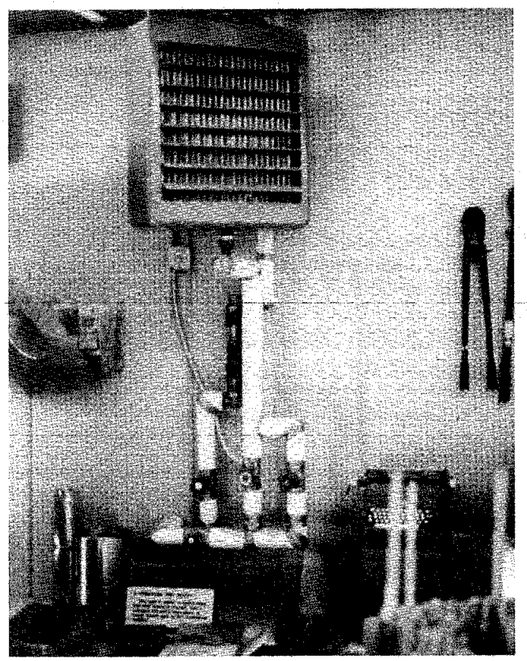


Injection well and heat exchanger trailer, at Wickes Home Lumber and Supply Company.



Hydronic heater demonstration in the lumber shed at Wickes Home Lumber and Supply Company.

2) passed through a heat exchanger, heating fresh water and ethylene glycol in a secondary loop to 94°C(200°F), and 3) returned to the reservoir through an injection well. The heated fluid in the secondary loop was pumped to heat exchangers in the lumber store (to heat the store) and lumber shed (to run six demonstration hydronic heaters) and beneath a connecting walkway (to melt the snow). Cooled fluid was returned to the secondary loop for reheating.



Radiator inside Wickes Home Lumber and Supply Company, which was heated completely with geothermal energy. Pipes plus temperature and flow gauges are under the radiator.

The heating system operated for 10 days in January 1978, for six weeks from August to September 1978, and for the months of April through June 1979. Continued operation was possible after this time, but the geothermal network was shut down and dismantled because the contract was completed.

From July 1977 through October 1978, the California Energy Commission provided primary funding to the Ben Holt Company of Pasadena to design, construct, and operate the heating system. Magma Energy, Inc. and Southern California Edison Co. provided additional support. The U.S. Department of Energy contributed funds extending operations of the system for a second heating season, from January through June of 1979.

The pilot project showed that reliable, extended operation of a geothermal space heating and snow melting system can be obtained through existing technology from Casa Diablo Geothermal field. The final report of the pilot project will be available this fall from the California Energy Commission Publications Unit. See the publications section of this Hot Line issue for an address.

Leases

Geothermal Lease Bids Net $800,000 from the July 1979 issue of B.L.M. Newsbeat

From the May 10, 1979 East Mesa KGRA lease sale, the U.S. Bureau of Land Management received high bids totaling $798,595.22 for leasing geothermal resources on three parcels with an aggregate of 6,959 acres in Imperial County.

Ed Hastey, California BLM State Director, said the high bidders, acreages and high bids were: Republic Geothermal, Inc., Tract 1, 2, 553 acres, $485,490.79; the same firm, Tract 2, 2,486 acres, $264,509.23; and Union Oil Company of California, Tract 3, 1,920 acres, $48,595.20.

There were no bids on five other parcels also offered in the East Mesa Known Geothermal Resource Area.

In addition to the cash bids made, successful bidders will be required to pay a 10 percent royalty on steam sources developed; 5 percent on by-products such as minerals; and 5 percent on commercially demineralized water. Fifty percent of such royalties are paid to the state of origin.

LEASE SALE SCHEDULE AS OF 8/9/79

Lease sale dates are provided by the state directors of the U.S. Bureau of Land Management (BLM). Lease sale dates are tentative until public notice is issued 30 days prior to sale. Lease sale notices may be obtained by contacting the appropriate BLM office.

Location of KGRA	Latest Sale Date Scheduled	Original Sale Date
Gillard Hot Springs and Clifton AZ	8/?/79?	8/?/79
New Mexico Reoffers NM	9/18/79	4/ /79
Mono-Long Valley CA	11/15/79	2/ /79
Crump Geyser/Klamath Falls/Burns Butte/Brettenbush HS OR	1/15/80	1/?/80
The Alvord OR	1/15/80	2/9/78
Lassen Hot Spring CA	3/?/80	3/?/80
Garlach NE, Double Hot Springs, and Fly Ranch NE NV	4/15/80	4/?/80
The Geysers (MPL) CA	7/15/80	5/?/79
Island Park (Idaho and Montana)	9/ /80	10/?/79
Belknap-Foley Hot Springs OR	10/30/80	7/6/78
Indian Heaven and Mt. St. Helens WA	10/30/80	3/19/79
McCredie OR	10/30/80	10/5/78
Mt. St. Helens WA	10/30/80	8/?/79
Newberry Caldera OR	10/30/80	5/1/80
Beckwourth Peak CA	11/?/80	6/?/79
Corwin Springs MT	12/?/80	12/?/80
Coso Hot Spring CA	12/?/80	12/?/80

Conferences

Hot Dry Rock Geothermal Conference, The Hilton Inn, Santa Fe, New Mexico September 17-18, 1979

The purpose of this conference is to summarize the progress, problems, results, and expansion of the Hot Dry Rock Geothermal Energy Development Program for the past year. The Hot Dry Rock program is managed and conducted by the Los Alamos Scientific Laboratory for the U.S. Department of Energy, Division of Geothermal Energy. An optional tour and talk at the Fenton Hill Hot Dry Rock site will be offered at the close of the conference.

For further information, contact John C. Rowley, Los Alamos Scientific Laboratory, Public Relations Office, MS 355, P. O. Box 1663, Los Alamos, NM 87545, or call (505) 667-3185.

Expanding the Geothermal Frontier, 1979 Geothermal Resources Council Annual Meeting, MGM Grand Hotel, Reno Nevada, September 24-27, 1979

This meeting will include 4 days of technical sessions, 3 special sessions, and 6 pre-post meeting field trips. For further information, contact the Geothermal Resources Council, P. O. Box 98, Davis, California 95616, or call (916) 758-2360.

Second Symposium on the Cerro Prieto Geothermal Field, Baja California, Mexico, Instituto Mexicano del Seguro Social Mexicali, Baja California, October 17-19, 1979

Papers to be presented at this symposium will describe current investigations into the geology, geophysics, geochemistry, subsidence, and reservoir engineering of Cerro Prieto Geothermal field. Registration fees include a simultaneous translation during sessions.

For further information, contact Ing. Alfredo Mañon Mercado, Coordinadora Ejecutiva de Cerro Prieto, Comisión Federal de Electricidad, P. O. Box 248, Calexico, California 92231.

The Fourth Gulf Coast Geopressured Geothermal Energy Conference
Joe C. Thompson Conference Center, University of Texas at Austin, October 29-31

This conference will emphasize research and development in this field. Sponsors of the meeting are the center for Energy Studies Bureau of Economic Geology, the Continuing Engineering Studies College of Engineering, University of Texas at Austin, and the Department of Energy.

Publications

California Regulations Ready Now

Copies of the following regulations are available from the Division of Oil and Gas, free of charge:

Regulations for implementing AB 2644 and the California Environmental Quality Act (CEQA) - effective September 25, 1979; and

Division geothermal regulations - effective September 16, 1979.

Copies of California Laws for Conservation of Geothermal Resources, published by the division, are also available free of charge.

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CO_2 Article Reprinted

A reprint of a 1942 Division of Oil and Gas article entitled "Imperial Carbon Dioxide Gas Field" is included in the April 1979 issue of the ISGE Transactions and The Geothermal Journal, vol. 4, No. 2. Commercial carbon dioxide production from Imperial Valley wells ended in December 1947 and production in 1947 was 297 Mcf. Cumulative production from the Imperial Valley wells was 2,523,857 Mcf. Originally, the article was printed in the Division of Oil and Gas Summary of Operations, vol. 28, No. 2.

☆

Environmental data for energy technology policy analysis, vol. 1, summary, January 1979, HCP/EV - 611 9/1. Prepared by The MITRE Corp. for the U.S. Department of Energy. $6.50. Available from the National Technical Information Service, Springfield, VA 22161.

This publication provides qualitative and quantitative information on the environmental aspects of different energy technologies. It is organized into sections by technology categories that include geothermal energy and hydroelectricity.

☆

Thermal waters of Nevada, Bul. 91. By Larry Garside. $6.00. Available by mail from the Nevada Bureau of Mines and Geology, University of Nevada, Reno, NV 89557. Available on campus from Room 310, Scrugham Engineering - Mines Building.

Nevada natural hot water and steam occurrences are described, such as springs, wells, and mine workings. Location data, geology, temperatures, flow rates, water chemistry, well depths, drilling and other exploration activities, and past and present uses are included.

☆

The California Energy Commission has several publications available on geothermal subjects. For a copy of the May 1979 Publications Catalogue and June-July Catalogue Addendum, write to the California Energy Commission, Publications Unit, 1111 Howe Avenue, MS-50, Sacramento, CA 95825, or call toll free: 800-852-7516.

☆

Geothermal energy, research, development, and demonstration program, third annual report, March 1979, DOE/ET-0090. Prepared by the Interagency Geothermal Coordinating Council. Stock No. 061-000-00285-5. $3.75. Available from the U.S. Government Printing Office, Wash. D.C. 20402.

The major accomplishments of this federal program and some private-sector achievements during FY 1978 (Oct. 1, 1977-Sept. 30, 1978), are described.

☆

Proceedings, fourth workshop, geothermal reservoir engineering, December 13-15, 1978. Edited by Paul Kruger and Henry J. Ramey, Jr. Publication code: SGP-TR-30. 342 pages. Stanford Geothermal Program, Interdisciplinary Research in Engineering and Earth Sciences, Stanford University, Stanford, California.

The proceedings include papers on reservoir physics, well testing, formation evaluation, field development, geochemistry, stimulation, and models.

☆

Geothermal environmental seminar - '78, May 9-11, 1978. Edited by Fayne L. Tucker and Lane R. Tanner. 352 p. $20.00. Available from ES&S Publications, c/o Publishers Services, P.O. Box 3914, San Rafael, California 94901.

Papers in this volume cover many topics relevant to the development of geothermal energy such as environmental effects of geothermal development, technology, and reservoir assessment. The keynote address at the seminar was titled "Achieving the Delicate but Essential Balance".

Hot Line Readers Survey

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