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# GEOTHERMAL HOT LINE

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### Coso Hot Springs Well Drilled

Naval property at Coso Hot Springs may overlie a vapor-dominant geothermal resource. Dr. Carl Austin of the Naval Weapons Center estimates the area of the vapor-dominant system to be 50 square miles and the potential production to be 4,000 MWe.

A temperature observation well about 4,845 feet deep has been drilled and shut in on this property by the U.S. Department of Energy. The well was cased with 7 inch casing to a depth of 2,500 feet.

An environmental assessment of the Coso Hot Springs area is planned for the spring and the Navy is soliciting interested parties to develop the resource.

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### INTERNATIONAL

#### Iranian Geothermal Resources Investigated

Rogers Engineering Co., Inc., of San Francisco has successfully negotiated a Phase I contract to detail areas of prospective geothermal resources in the regions of Sabalan, Sahand, Damavand, Khoy, and Maku in Northwestern Iran. The project areas encompass over 31,000 square kilometers (12,000 sq. mi.).

Exploration teams are now in the areas to conduct geologic, geohydrologic, and geochemical surveys. It is anticipated that the work in these five regions will be completed in 1978. The rugged terrain and intermittently heavy snow and rainfall at the higher elevations challenge the crews to maintain their schedule.

Rogers executed the contract with Tehran Berkeley, a consulting firm based in Tehran holding a prime contract with the Imperial Government of Iran. Rogers has subcontracted with Senturion Sciences, Inc. of Tulsa, Oklahoma and Geothermex, Inc. of Berkeley, California, to participate in the exploration phase of the geothermal resource development project.

#### Department of Energy Funding

#### Oregon Institute of Technology

The Oregon Institute of Technology (O.I.T.) has been chosen by the Department of Energy to study geothermal resources in Alaska, Idaho, Montana, Oregon, Washington, and Wyoming. The D.O.E. awarded O.I.T. a \$383,385 grant for the study. D.O.E.'s goal is to accelerate commercial use of geothermal energy by developing programs for each region.

Industry and the public will be alerted to the geothermal potential of an area through mass media presentations. Prospective geothermal sites which do not show potential for commercial development will be recorded and have their characteristics defined. In promising geothermal areas, time-lines will be drawn to establish activities that will affect and control the development of the resource.

#### Utah

The Department of Energy has awarded contracts to Union Oil Company of California and Getty Oil Company for geothermal wells in Southwestern Utah. Union received a contract to drill, test, and provide data from three 10,000 foot holes in the Cove Fort-Sulphurdale area. D.O.E.'s maximum cost would be \$2,559,258. Getty received a \$396,000 contract to drill a 6,000 foot exploratory well in the Roosevelt Hot Springs area.

#### LOUISIANA

#### Successful Well Test Near Delcambre

The Energy Research and Development Administration (ERDA) geothermal well test near Delcambre was shut-in on July 21 and termed successful. The purpose of the test was to learn if hot salt water, methane, and other hydrocarbons could be separated and used as new sources of energy.

According to an ERDA report, the test well produced 10,000 barrels of salt water a day, and natural gas was recovered at rates exceeding 1.5 million cubic feet a day during the initial part of the flow test. This volume indicates undissolved natural gas was recovered in addition to the dissolved, geopressured natural gas. The water production rate was reduced to 3,000 barrels a day toward the end of the flow test and natural gas was recovered at about 200,000 cubic feet a day or approximately 70 cubic feet per barrel of fluid.

ERDA reports that bottom-hole fluid samples taken from the test well were: Sand 1 with 15 standard cubic feet (scf) of natural gas at 232°F with 11,000 pounds of pressure per square inch (psi), and Sand 2 with 17 to 18 scf of natural gas at 238°F and 10,700 psi. Both samples contained large quantities of dissolved salt which is known to reduce the amount of natural gas that can be dissolved in a water-salt solution. The flow well test produced 60 to 70 scf of gas per barrel of water. Therefore, the additional natural gas above 15 to 18 scf is thought to be undissolved natural gas associated with the water-natural gas solution.

ERDA has scheduled another geothermal research project in Cameron Parish to determine if a selected geopressure reservoir in that area is of high enough quality to justify drilling a well. Magma Gulf Corporation of Baton Rouge will conduct geophysical studies at the test site which was chosen because of its 500-foot band of sands. The work will probably involve several months of seismic work to establish the boundaries of the geopressured reservoir.

#### CALIFORNIA

##### Conservation Director Resigns

Dr. Priscilla C. Grew has resigned from the position of Director of the Department of Conservation, effective January 1, 1978. Her husband, Dr. Edward Grew, received a Fulbright grant at the University of Melbourne, and she will join him in Australia to resume her geological research career.

Dr. Grew began as Director of the Department of Conservation on February 1, 1977. Preceding this appointment, she was chairman of the Mining and Geology Board and an assistant research geologist at the Institute of Geophysics and Planetary Physics at UCLA. She earned her B.A. in geology from Bryn Mawr College and her Ph.D., also in geology, from UC Berkeley.

##### Geothermal Task Force Visits Cerro Prieto and the Imperial Valley

The California State Geothermal Task Force, whose members represent both state agencies and the Legislature (Hotline, April, May, and September 1977), visited most geothermal operations in Imperial Valley and Baja California. The trip included stops at Cerro Prieto geothermal field in Mexico, and Heber, East Mesa, Brawley and Niland geothermal areas in Imperial County, California.

##### Geothermal Task Force Draft Report Hearing

The Geothermal Task Force is charged with studying all parameters of the development of geothermal resources within California. They must report the findings to the Legislature and the Governor.

To receive comments on the first draft of the Task Force report, a public hearing, chaired by Bill Kirkham of the Office of Planning and Research, was held on November 9th at the State Capitol, Sacramento. People testifying at the hearing were:

<u>Witness</u>	<u>Affiliation</u>	<u>Witness</u>	<u>Affiliation</u>
Bill Northrup	- State Lands Commission	Dave Butler	- Chevron Resources
Steve Rios	- Native American Heritage Commission	Glen West	- P. G. & E.
Jim Gordon	- Supervisor, Lake County California	Carl Harper	- Lawyer
Fred Biagini	- P. G. & E.	Fred Longyear	- Fred Longyear Assoc.
Robert Roby	- Lake County Energy Council	C. M. Lafoon	- Republic Geothermal
Benny La Morte	- Lake County Energy Council	Ed Gabrielson	- S. D. G. & E.
Dave Pierson	- Public Works Director, Imperial County	Mike Tomaloff	- Sonoma Co. A.P.C.D.
Carol Otte	- Union Oil Co. of Calif.	Rollin Russel	- McCulloch Oil Corp.
Richard Miller	- Wilbur Hot Springs	Paul Zamarian	- Integrated Health Commission
Joe Aidlin	- Magna Power Co.		

After the hearing, the Task Force met in November and December to discuss the draft report and the recommendations. A final executive summary, the report, and dissenting opinions will be issued soon.

#### D.O.G. Has Moved in Santa Rosa

The Santa Rosa geothermal office of the California Division of Oil and Gas, formerly located at 240-D Coddington Center, Santa Rosa, CA 95401, has been moved. The new office is at 2904 McBride Lane, Santa Rosa, CA 95401. The telephone number, unchanged, is (707) 525-0479.

#### Lassen Greenhouses

Lassen County's geothermal resources will be tapped in the near future by an Oakland firm that plans to construct 150 greenhouses. The total project cost will be nearly \$3 million.

Geo-Products of Oakland has announced that it will construct about thirty-five, 3,500 square foot greenhouses this fall and more in 1978 on 3,000 acres at Wendel, California.

Tomatoes, lettuce, cucumbers and other experimentally grown produce will be raised in geothermally heated greenhouses. The produce will be sold locally and to major markets and chain outlets.

Board chairman Alexander Black said the Wendel property, 25 miles east of Susanville, is owned by VTN of Irvine and himself and leased to Geo-Products.

#### Geothermal Heat Exchanger Tested

A new type of geothermal heat exchanger, capable of efficient operation with the most difficult of geothermal fluids, has been used to successfully generate electricity by a binary-cycle process in tests at the Geothermal Component Test Facility near El Centro, California.

These tests, directed by the University of California's Lawrence Berkeley Laboratory, mark the first use of the binary-cycle process to generate electricity from geothermal energy in the United States and the first use of a direct contact heat exchanger in the binary-cycle process.

The conventional binary-cycle has two separate loops: one loop carries the hot geothermal brine and the second a working fluid. The working fluid is heated by the hot brine in the heat exchanger and vaporized. The vapor is used to drive a turbine.

In the direct contact binary-cycle, a turbine is driven as a result of mixing the working fluid and hot geothermal brine. Under this process of direct contact heat exchange, the brine heat is transferred to the working fluid. Once the working fluid is separated from the brine, the working fluid vapor drives the turbine.

#### \$150 Million Investment in Lake County

Groundbreaking ceremonies for what will be the world's largest geothermal generating plant were held at The Geysers. The 135,000 kilowatt facility, the first to be located in Lake County, is scheduled for completion in 1979. It will be able to produce sufficient electrical power to supply one-quarter of San Francisco's needs.

At the ceremonies, a spokesman for R. J. Reynolds Industries said the company is prepared to spend \$150 million over the next 30 years developing and drilling steam wells on its 80,000-acre lease tract in Lake County. Since 1965, when Reynolds' Aminoil subsidiary first began drilling at The Geysers, the company has invested over \$40 million and brought in 27 successful wells. All wells have been capped and are awaiting the completion of the \$30 million generating plant that Pacific Gas and Electric Company (PG&E) will now build and operate.

Permits have been filed for a second Aminoil-PG&E unit and, according to the Reynolds spokesman, plans exist for several more. A spokesman further stated it would take over 1.4 million barrels of oil a year to produce the amount of electricity that will be generated from the first plant.

#### Santa Clara Looks Ahead

The City of Santa Clara has purchased over 10,000 acres in Lassen and Sierra Counties for geothermal exploration.

Santa Clara city officials said the 10,000 acres were purchased for \$1.6 million from Frank Trosi of Chilcoot, and Camille Ryan of Atherton.

According to Tom Goulding, administrative assistant for the City of Santa Clara, the land is located in the vicinity of the Beckworth known geothermal resource area. Six thousand five hundred acres are in Lassen County and the remainder in Sierra County.

The city plans to investigate the power generation potential of these resources.

### Union Proposes Development at Cobb Mountain

Full geothermal development with 48 wells and at least one power plant is proposed by Union Oil Co. on the summit of Cobb Mountain. The site of the proposed project lies eight miles northwest of Middletown in a 1,000-acre leasehold located in Lake and Sonoma counties.

Four wells will be drilled to verify the existence of a suspected dry steam resource and to identify the characteristics of any steam that is found. If the exploratory project is successful, Union Oil proposes to negotiate with a utility company to purchase steam and build a power plant in the area. Development will then continue.

Of the 48 wells to be drilled, about 30 will be required for production of electricity. If the remaining 18 wells are drilled, they will either be utilized as reserve wells or be used to service another power plant.

Commercial quality geothermal resources have been proved on three sides of the project area: Castle Rock Springs, The Geysers, and McCulloch Oil Corporation's Francisco leasehold.

### Lake County Power Plant

The California Department of Water Resources plans to build a 55 Mw power plant to supply power for the California Water Project. The plant is to be completed in January 1983 and will be located northwest of Cobb Mountain on the Francisco leasehold about 17 miles south of Lakeport.

The steam suppliers will be McCulloch Geothermal Corp., Geothermal Kinetics, Inc., and Entex Petroleum, Inc. The EIR for the plant has not been submitted.

### GRIPS Update: (Hotline April 1977)

Workshops conducted by Lawrence Livermore Lab (LLL) for the Geothermal Resource Impact and Planning Study (GRIPS) are part of a data gathering study for Lake, Mendocino, Napa and Sonoma Counties. The goal is to plan development of an information base for The Geysers - Calistoga KGRA environment. The data will be used by the Department of Energy to plan research and development studies to describe the effects of future geothermal development. Workshop participants have included field developers, utility and service company representatives, consultants, and representatives from federal state and county agencies. Topics have included air quality, water quality, and environmental geology.

### FEDERAL

#### Portland USGS Geothermal Office Moves to Santa Rosa

The Portland, Oregon, District Geothermal Supervisor's office has been moved from Room 100, Building 100, 1425 NE Irving, Portland, Oregon, P.O. Box 2967, 97208, to Room 213, Federal Building, 777 Sonoma Avenue, Santa Rosa, California, P.O. Box 3539, 95402.

#### Supreme Court OK's U.S. Mineral Rights

On October 31, 1977, the U.S. Supreme Court cleared the way for the Federal Government to assert ownership of geothermal reserves under some private lands at The Geysers and elsewhere in the West.

At issue at The Geysers, the pioneer spot for U.S. geothermal development, was an interpretation of the 1916 Homestead Act which made it possible for affected lands in that area to pass from the federal domain to private ownership.

The 1916 law opened 35 million acres in the West to cattle-raising. Individuals could gain title to 640 acres for this purpose. However, in drafting the statute, Congress reserved for the federal government the title to all coal and "other minerals" under these lands.

In 1965, as the full financial implications of geothermal energy became evident, property owners at The Geysers queried the Interior Department about their subsurface rights. Edward Weinberg, then deputy solicitor, replied that geothermal steam was not a mineral and the government thus would not claim title to it.

In 1970, Congress passed legislation which set ground rules for new leases of geothermal resources on public lands. But it evaded the issue of the rightful ownership of resources under land opened up under the 1916 act. Instead, the lawmakers ordered the Justice Department to bring suit over this issue and let the courts decide the matter.

In 1972, the department sued the private owners of The Geysers for recovery of damages - namely the royalties.

The department lost in the federal district court in San Francisco. However, the U.S. Ninth Circuit Court of Appeals reversed the decision, holding that Congress back in 1916 intended to give up only surface rights to encourage agriculture. It was this ruling which the Supreme Court let stand by refusing to accept an appeal from the private landowners.

#### Computer Program for Geothermal Plants

A computer program has been developed to provide data for designing and maintaining geothermal power plants, according to Vassel Roberts, manager of EPRI's Geothermal Program.

The program, developed by Battelle, Pacific Northwest Laboratories under an EPRI contract, allows engineers to estimate which minerals in geothermal fluids will form deposits. The information is useful in designing geothermal power plants and in preventing operational problems.

The program can be used on a small laboratory computer to predict acid concentrations, gas pressures, potential mineral precipitants, and concentrations in aqueous solution at temperatures from 25°C to 300°C - the normal range for geothermal brines. The program is part of an EPRI research effort to simulate scale deposition and corrosion over the life-time operations of a geothermal plant.

#### CONFERENCES

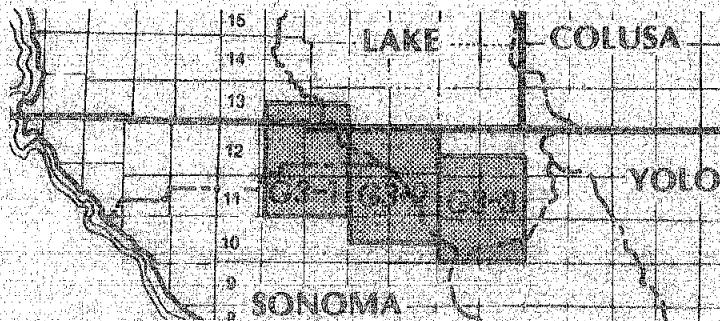
April 26 - 29, 1978: 53rd annual meeting, Pacific Section of the American Association of Petroleum Geologists (AAPG), Society of Economic Paleontologists and Mineralogists (SEPM) and Society of Exploration Geologists (SEG), Sacramento, California. The theme is "Energy Exploration and Politics" and the conference will include papers on the subject of geothermal energy as well as a field trip to The Geysers Geothermal Field. Information: Convention Committee 1978, P.O. Box 214788, Sacramento, CA 95821.

## PUBLICATIONS

Energy Bibliography and Index - Books, pamphlets, maps, technical reports, government documents, monographs, serials, and periodicals. Each entry has a 50 to 100 word abstract. The Index will be published in 4 volumes, one a year, to be followed by a cumulative index. \$295.00 for volume 1. Gulf Publishing Company, P.O. Box 2608, Houston, Texas 77001, (713) 529-4301.

## New Geyser Maps

Three new maps of the Geysers Geothermal Field in Lake, Sonoma, Mendocino, and Napa counties will be available in February 1978. The scale of the maps (No.'s G3-1, G3-2, and G3-3) is 1:20,000m. You can obtain these maps from the California Division of Oil & Gas, 1416 Ninth Street, Room 1316-35, Sacramento, CA 95618.



## New Map of Geothermal Energy Resources of the Western United States

A multicolor map showing the geothermal energy resources and related data for the Western United States has been prepared by the National Geophysical and Solar-Terrestrial Data Center (NGSDC) in cooperation with the Energy Research and Development Administration and the U.S. Geological Survey. The area covered extends from slightly east of the Rocky Mountains to the Pacific coast and from Mexico to Canada.

These data are on the map: (1) high-temperature hydrothermal convection systems, color coded according to temperature; (2) locations of over 1000 low temperature thermal springs; (3) "Known Geothermal Resource Areas" (KGRAs); (4) prospectively valuable areas for geothermal resources; (5) heat-flow measurement locations and values; (6) earthquake epicenters; (7) major faults; and (8) volcanoes and volcanic cones of Quaternary and late Tertiary age.

The map, which measures approximately 46 by 35 inches, is on the standard Albers Equal Area Projection at a scale of 1:2,500,000. Copies at \$2.50 are available from: NOAA/National Ocean Survey, Distribution Division, C/L, Riverdale, MD 20840.

Summary Environmental Analysis for Geothermal Energy Development in The Geysers Region, Volumes I, II/Volume III (Appendix), May 1977. Available from the Energy Resources Conservation and Development Commission, Publications Unit, 1111 Howe Avenue, Sacramento, CA 95825.

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