

GEOHERMAL HOT LINE

A Publication of the
CALIFORNIA DIVISION OF OIL AND GAS

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Environmental Protection Agency
Safe Water Drinking Act

The June 3, 1977 Draft of the EPA's Safe Water Drinking Act has been reviewed and the portions affecting geothermal operations are as follows:

a) Subpart C, Section 146.20, page 26.

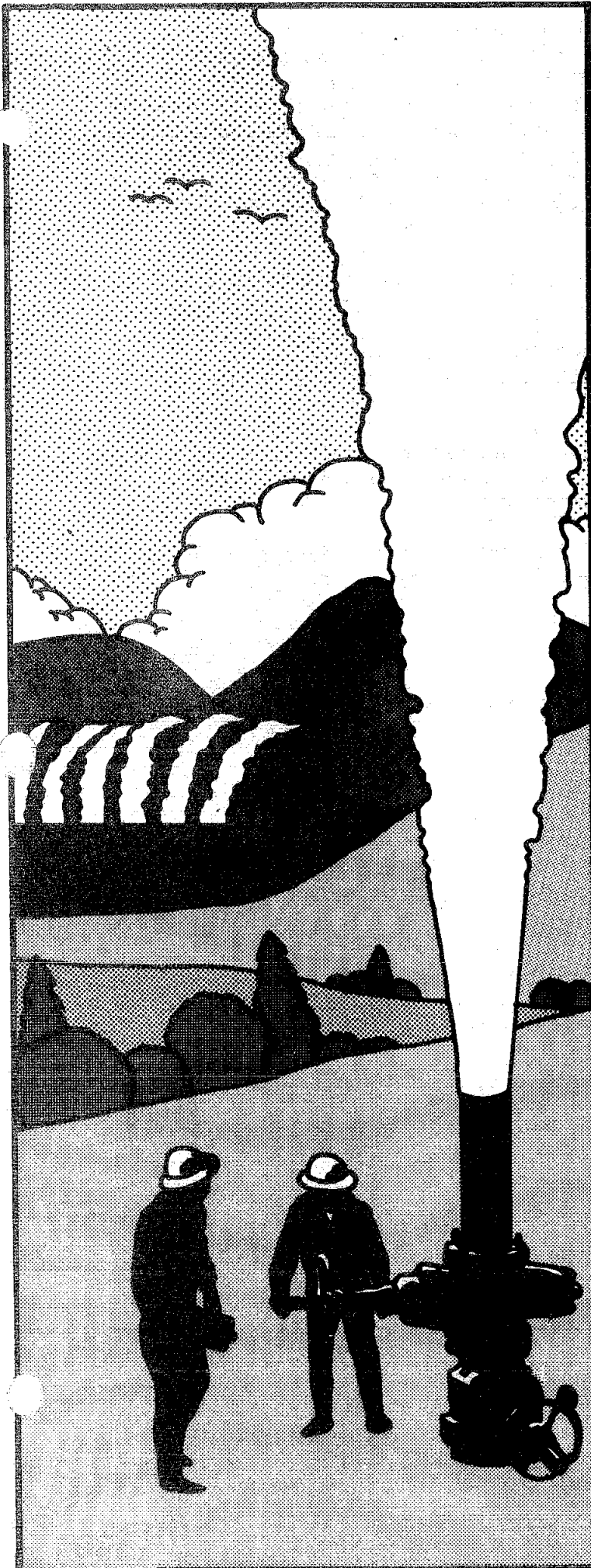
Section 146.21, (b) page 27.

"The Director shall review the completion and plugging reports of all wells of public record penetrating the injection zone within a two mile radius of the injection well or within the zone of endangering influence."

Section 146.22, (e), 4, page 31.

"The wells in (e)(2) above are monitored daily with sufficient analyses being made to detect any leachate excursion."

Section 146.23, (c) page 32.



A map showing well number, or name and location of all producing wells, injection wells, abandoned wells and dry holes, surface bodies of water, mines (surface and subsurface), quarries, water wells and other pertinent surface features including residences, roads and bedrock outcrops within a two mile radius or the zone of endangering influence of the proposed injection well. The map should also show faults and fractures, if known or suspected. Only wells of public record are required to be included on this map. If the zone of endangering influence is used in lieu of the two mile radius, all data and calculations used to determine this zone must be submitted. The lateral extent of the zone must be indicated on the map.

Section 146.25, Monitoring and Record Keeping Requirements for Wells under this subpart, page 35.

(a) "Each permit for waste disposal, nuclear waste storage and special recovery process wells except geothermal shall require monitoring and recording on a weekly basis....."

(b) "Each permit for wells associated with geothermal operations, in situ gasification, and Frasch process wells shall require monitoring and recording on a daily basis of surface injection pressure and volume of fluid injected."

Anyone wishing to make comments concerning these State Underground Injection Control Program Draft Regulations should send their comments (in triplicate) to:

Office of Water Supply (WH-550)

Environmental Protection Agency

Washington D.C. 20460

Attention: Comment Clerk, State Underground Injection Control Regulations

International

Geonomics, Inc.

Geonomics, Inc., of Berkeley, California has signed a three quarter million dollar contract with Empresa Nacional de Energia Electrica (ENEE) of Honduras, to carry out geotechnical exploration in five prospective geothermal areas in that country. The project will consist of geological, geochemical, and geophysical investigations. Geochemex an associate organization under the direction of Dr. Franco Tonani, will carry out detailed water and gas sampling. Electrical resistivity surveys will be carried out utilizing both active and passive techniques, in a unique combination which is designed to reduce the overall cost of exploration.

The project is scheduled for seven months with the ultimate result being an assessment of alternative sites for potential deep drilling. ENEE would like to determine within two years or less whether geothermal energy can replace other potential power supply systems which are costlier or require a longer lead time.

Geonomics has just completed the first phase of a project in San Miguel, Azores. In cooperation with the Institute of Geosciences of the Azores, steam has already been discovered while drilling confirmatory temperature gradient holes. The second phase of the project, including deep drilling, started this August, when a Portuguese drilling company commenced the deep drilling operation under Geonomics' supervision. The combination of the geophysical and geochemical data suggests that a reservoir at a temperature range of 200-250°C will be encountered at a depth of about 500 meters. The geothermal fluid is likely to be a liquid-dominated reservoir, a low salinity, with relatively low mixing with sea water. It is estimated that the geothermal reservoir has a potential capacity to support a 300 megawatt power plant for a quarter of a century. The total installed capacity of the Island of San Miguel is less than 20 MW at present, serving a population of 180,000.

NEVADA

Geothermal Leases: The Bureau of Land Management held a competitive lease sale on May 17 and Getty Oil Company was awarded geothermal leasing rights to 1,312 acres of national resource lands in the Warm Springs Known Geothermal Resources Area in Nye County. Total bid price was \$11,282.34. No bids were received on 8,014 acres offered in the Pinto Hot Springs area, Humboldt County. This was Nevada's 13th geothermal lease sale.

NEW MEXICO

Lease Sale

On May 25, 1977, at Baca Location One, NM, 29,375 acres were offered in 17 tracts. 18,050 acres, (11 tracts) received 22 bids for a total amount of \$827,320.78. All high bids were accepted with Aminoil USA receiving 3 leases, Amax Exploration, Inc. receiving 5 leases and Phillips Petroleum Company, 3 leases.

CALIFORNIA

Geothermal Task Force

Update: Hearings (Hotline April, 1977)

The fourth and final scheduled geothermal task force hearing was held in San Francisco on May 26 and 27. It covered the status of geothermal resource development, the state of current technology, economic and business concerns, regulatory issues, environmental problems and considerations, and federal regulation of geothermal development. Testimony was given by the following witnesses:

May 26

<u>Witness</u>	<u>Affiliation</u>
Chuck Frederickson	- California Institute of Technology (JPL)
John Goldsmith	- California Dept. of Health
Gerald Gould	- U.S. Forest Service
Wayne Williams	- Plant Pathologist
James Slosson	- Seismic Safety Comm.
Albert Holmes	- Energy Marketing and Management Association

<u>Witness</u>	<u>Affiliation</u>
Bill Woods	- Aminoil USA, Inc.
Rollin Russell	- McCulloch Oil Corp.
Subir Sanyal	- Geonomics, Inc.
Roy Alper	- Citizens Action
Clyde Kuhn	- Archeologist
Bill Bishop	- EPA, Region 9

May 27

<u>Witness</u>	<u>Affiliation</u>
Mel Swinney	- Southern California Edison Co.
Reid Stone	- U.S. Geological Survey
William Daniel	- U.S. Navy, NWC
Carl Austin	- U.S. Navy, NWC
Harry Parode	- U.S. Navy, NWC
Vasel Roberts	- Ele. Power Research Inst.

<u>Witness</u>	<u>Affiliation</u>
John Alexander	- John Alexander Company
Ed Aderkus	- U.S. Fish and Wildlife Service
Wes Churchman	- LBL
Jack Lar	- U.S. Bureau of Land Management
Glen West, Jr.	- P.G.&E.

Update: Members of the State Geothermal Task Force (Hotline May, 1977).

The following changes have occurred in the membership of the geothermal task force: Bob Moeck from the Public Utilities Commission was replaced by Don Steger, and Susan Brown from the Office of Planning and Research was replaced by Judy Warburg. Also, Stephan M. Rios of the Native American Heritage Commission and Hans Kreutzberg of the Department of Parks and Recreation, Office of Historic Preservation, were added as unofficial members.

Joint Geothermal Study

The California Energy Resources Conservation and Development Commission and the federal Energy Research and Development Administration have joined with the City of Desert Hot Springs to determine the feasibility of using geothermal resources for purposes other than the generation of electricity.

Desert Hot Springs sits atop an area of known geothermal resources in the upper Coachella Valley. However, because it is located in the Colorado Desert where heating is rarely needed, researchers are interested in developing other ways to use these resources.

The \$200,000 study will determine different methods for developing Desert Hot Springs' geothermal resource as an economic and environmentally acceptable alternative to electricity, natural gas, and oil, and will review social, legal, institutional, and environmental issues regarding the uses of this resource. Researchers will design a system which will be implemented in the community and also be applicable to other geothermal areas.

New Power Plant

The Northern California Power Agency (NCPA) and Shell Oil Company have announced that Shell will supply geothermal steam to a 110-megawatt plant that PG&E will build. The plant will supply part of the power needs of the Cities of Roseville, Santa Clara, Alameda, Lodi, Ukiah, Lompoc, and Healdsburg, and the Plumas - Sierra Rural Electric Cooperative.

Scheduled for completion in late 1980, the power plant will be built on one of Shell's geothermal leases in The Geysers steam field, some 80 miles north of San Francisco. It will cost an estimated \$30-35 million and will require approximately 2 million pounds of steam per hour. The plant will have the added environmental and energy conservation advantages of not using fossil fuels.

This is Shell's first steam contract. The company leased 4,077 acres of federal land near The Geysers field in Sonoma and Lake Counties in January 1974, and leased 12,931 acres of private land in Lake, Sonoma, and Napa Counties. Shell has completed six producing wells on the federal leases with a combined potential of 725,000 pounds of steam per hour. The remainder of the 2 million pounds per hour of steam required by the plant will come from additional wells in the area.

Mammoth Geothermal Project

The State Energy Commission has begun a program in Mammoth Lakes Village to determine whether geothermal resources can be used instead of electricity to heat homes and businesses. The \$199,000 project will bring hot water from the Casa Dizablo Hot Springs area to heat a lumber store and four different heating units in an adjacent storage building. Currently, the lumber company uses expensive liquefied petroleum gas for heating. The project will provide information on the reliability of the area's geothermal resource and determine the most efficient of the five different heating units.

Ben Holt Company, an engineering firm in Pasadena, will carry out the project in cooperation with Southern California Edison Company, the local utility, and Magma Power Company, owner of the geothermal wells. Beginning this fall, a model of the system will be displayed in the U.S. Forest Service visitor center at Mammoth Lakes for public viewing.

Heber Power Plant (UPDATE: Hotline April, 1977)

San Diego Gas and Electric has awarded a \$42 million contract to Fluor Corporation for design and construction of a 45-megawatt electric geothermal power plant to be built at Heber, near El Centro in the Imperial Valley. The Electric Power Research Institute has committed \$1 million for preliminary engineering and environmental studies, but construction of the facility is contingent on receipt of federal financing through U.S. Energy Research and Development Administration. The plant, proposed for operation 1980, would be powered by geothermal brine, unlike the PG&E generating plants at The Geysers in Sonoma County which are powered by dry geothermal steam.

Lake County

The State Court of Appeal ruled that Magma Energy, Inc. can drill two exploratory wells on Mt. Konocti in Lake County.

Opponents of the project claimed an environmental impact report (EIR) filed with the drilling application failed to assess effects of potential commercial development. Magma had asked the Lake County Planning Commission for a use permit to drill three exploratory wells but the Commission ordered that a full EIR be prepared.

The EIR assessed only the effects of the exploratory drilling and not the impact of geothermal production. The commission accepted the EIR and the Board of Supervisors granted a use permit. The Lake County Energy Council challenged the permit, but a Superior Court judge refused to revoke it.

Magma contended that its EIR need extend only to the exploratory drilling phase, and the appeals court agreed, stating

".... Where future development is unspecified and uncertain, no purpose can be served by requiring an EIR to engage in sheer speculation as to future environmental consequences."

The decision in no way commits the supervisors to approve general commercial development and the current EIR calls for a very comprehensive EIR prior to any future commercial development.

Lake County Approves Three Projects

Because of new H₂S pollution abatement devices and noise control measures, the Lake County Board of Supervisors approved three controversial geothermal projects for Lake County.

Phillips Petroleum received all necessary permits to drill an exploratory well in the Borax Lake Project, in Sec. 7/13N/7W, within one mile of a densely populated area near the town of Clear Lake Highlands. Final approval was granted by the Board of Supervisors on 6/20/77. Feasibility of well plugging, proven in highly successful tests conducted by the Union Oil Company to avoid steam venting, also helped convince the Board that wells can safely be drilled close to populated areas.

On June 16, 1977, McCulloch Geothermal Corporation was issued a use permit by the Lake County Planning Commission to drill on the Cobb Valley Leasehold in Sec. 28/12N/8W.

Union Oil Company's permit to drill in the Thurston Lake area, granted by the Board of Supervisors and the Planning Commission, was upheld by the Lake County Superior Court. The court decision was that approval of the well did not constitute approval of a power plant, and in the event of successful completion of the well, another environmental impact report would be necessary.

Funds for a four-county study designated as GRIPS (Geothermal Resources Impact Planning Study) covering counties of Mendocino, Lake, Sonoma and Napa, have been committed by the Energy Commission of California and the Federal Energy Commission.

Energy Information Center

This August marked the first anniversary of San Francisco's Energy Information Center, headquarters for a program developed by the regional offices of FEA, the Energy Research and Development Administration (ERDA), and the Environmental Protection Agency (EPA). The program's purpose is to direct citizens to federal experts who can help solve specific energy problems. To date, 5,400 residents of California have received printed information or personal assistance on energy-related matters from the new federal interagency service.

The center also offers 5,500 pieces of informational data relating to energy on microfilm. Supplementing the microfilm collection is a library of printed information which includes both agency reports and privately published texts. The center's materials are available to users at local libraries throughout the region via standard interlibrary loans.

For a small fee, patrons have complete access to ERDA's and FEA's computer retrieval services. These services list the titles of energy-related material in various energy categories.

Some of the information published by FEA, ERDA, and EPA is available to the public at no cost and covers such subjects as insulating older homes, solar and geothermal energy, and gas mileage guides for new cars.

The center is located at 100 California Street in San Francisco, California 94111; phone number (415) 556-7328.

Assistant Geothermal Officer For C-DOG

On July 1, 1977, Dennis Olmstead accepted a position as Assistant Geothermal Officer with the California Division of Oil and Gas. For the past three years, Dennis has worked as an Energy and Mineral Resources Engineer in the division's Long Beach and Woodland offices. Before this, he was employed by a soil engineering firm in Sacramento.

Dennis received a Bachelor of Science degree in geology from the State University of New York at Oneonta and a Master of Science degree in oceanography from the University of Washington.

LEGISLATION (CALIFORNIA)

Update: AB 566 (Hotline, May 1977)

AB 566, which changes the bonding law of oil, gas, and geothermal wells, has been signed by the Governor and is now in effect. The new bond amounts for both individual and blanket surety and cash bonds has been modified. Also, the individual bond amounts now vary according to total-depth ranges. (See previous issue for details).

For operations permanently altering casing, bond coverage will be determined by the proposed effective depth of the well after the rework if the well is to be cleaned out, and by the effective depth before the rework if the well is to be plugged back.

Update: AB 985 (Hotline, May, 1977)

AB 985, an emergency amendment to extend more time and resources to the Geothermal Task Force, was signed by the Governor on July 8, 1977.

LASL Reports Geothermal Breakthrough

The Los Alamos (N.M.) Scientific Laboratory (LASL) has recorded a significant breakthrough in geothermal research. They have created a man-made geothermal well system 2 miles deep in the Valles Caldera in the Jemez Mountains of New Mexico by producing a fracture system in hot granite. The achievement is a major step in the Energy, Research and Development Administration's (ERDA) hot, dry rock geothermal energy program.

LASL Director Dr. Harold M. Agnew said 2 bore holes drilled into the west flank of the Valles Caldera, 20 air miles west of Los Alamos, were linked as evidenced by a significant flow of water between the two. The water flashed to steam as it was diverted to a nearby holding pond. Temperatures of 130°C (265°F) were recorded after 20 hours of pumping. Based on preliminary measurements of water flow, over 92 percent of the water injected will be recovered after a month of operation. This recovery level is anticipated to increase with time. Testing will also show whether the initial heat transfer rate will remain the same or fall off with time.

LASL's system consists of 2 holes drilled almost 2 miles deep that are separated at the surface by about 250 feet. Hydraulic fracturing was used to crack the granite thus exposing a large heat-exchange surface with a temperature of about 204°C (400°F). Water pumped down the hole at 900 to 1000 psi was recovered at a temperature of 130°C (265°F). Back pressure was applied at the second hole to keep the water from boiling until surface pressure was released.

The next step in the Energy Research and Development Administration-funded program is installation of two 10 Mwt (megawatt thermal) heat exchangers to study the feasibility of a closed-loop pressurized water system. If the present system continues to show promise, ERDA plans to design a system 10 times larger than the existing one by drilling deeper into hotter granite at a depth of 12,500 feet.

Such a system would be capable of driving a 10-MWe (megawatt electric) power plant. Although LASL does not plan to construct a power plant, Dr. Robert Brownlee, head of the Laboratory's Geosciences Division, says a utility company and ERDA are discussing the possibility of harnessing such a plant to an enlarged LASL system.

Brownlee describes the potential of hot, dry rock geothermal energy as "enormous," and further states, "There are 13 million quads of thermal energy in rock with a temperature above 300°F (150°C) up (sic) to a depth of 6 miles (10 kilometers) beneath the continental United States. United States consumption of energy averages between 70 and 80 quads per year."

In some cases, costs could favor co-generation systems that produce both heat for electricity and direct space and process heat for nonelectric applications. By using an organic vapor-turbine especially designed for low-temperature operation, efficient operation can be achieved. Furthermore, if hot, dry rock geothermal systems of this type were near population centers, hot water or steam could be economically pumped to buildings for space heating.

COSO Geothermal Development

U.S. Navy plans for developing the COSO geothermal area were described by Dr. Carl Austin, a Navy Geologist, at a briefing coordinated by Governor Brown and Senator Stern of Bakersfield on July 29. The Navy and ERDA plan to drill an exploratory hole 4,000 to 6,000 feet deep in this area to assess the resource. BLM will spend \$500,000 for an EIS.

Governor Brown and Rusty Schweickart, assistant to the Governor for science and technology, attended the meeting along with geothermal task force members. The Governor wants to coordinate state and federal environmental impact reports to speed up the project. Potential electrical power from this geothermal area is estimated at 400 MW.

FEDERAL

Foreign Investment in U.S. Energy Supplies Studied

Although foreign direct investment in U.S. energy industries has almost doubled from \$14.9 billion in 1971 to \$26.7 billion in 1975, there is no evidence that OPEC countries have invested in U.S. energy sources and supplies, according to a report recently published by the FEA.

The report concludes that most of the \$26.7 billion investment is by Western European and Canadian companies and this ownership is small compared to the investment of U.S. firms in energy sources and supplies in other countries. The study was published by the FEA's Office of International Energy Affairs.

However, foreign direct investment in the U.S. petroleum industry is growing. In 1975, it was \$8.2 billion, or 30.7 percent of all foreign direct investment, up from 22.3 percent, or \$3.2 billion, in 1971. Most of the current holdings are in so-called downstream operations such as refining and marketing.

In the U.S. nuclear industry, less than 1 percent of the total nuclear reserves and 6 percent of the total uranium ore production, 12,400 tons, are held by foreign-owned companies. Eighteen companies, either foreign-owned or joint ventures with U.S. firms, are exploring for uranium in the United States.

In the coal industry in 1974, eight foreign-owned or partially foreign-owned companies mined 2.8 percent of U.S. production or 16.7 million tons of coal. Although the report found no commercialization of alternative fuels by foreign-owned companies, several firms are involved in exploring for and developing oil shale and geothermal energy resources, and in demonstrating solar energy technologies.

The United States has traditionally maintained an "open door" policy toward foreign investment in its economy. Following the oil embargo of 1973 and the subsequent accumulation of large oil revenues by oil-exporting countries, concern grew in Congress over the extent of foreign investment. The 1974 Federal Energy Administration Act requires the FEA to review foreign investment in domestic energy industries and continue monitoring the influence and control exercised by foreign ownership.

Foreign direct investment is defined as "the direct, indirect, or a combination of direct and indirect ownership of 10 percent or more of the voting stock of an incorporated or unincorporated U.S. business enterprise."

ERDA: The May 4, 1977 Federal Register states, in part: "The Energy Research and Development Administration (ERDA) is requesting an expression of interest (REI) from organizations desiring to participate in a demonstration project for the utilization of geothermal energy for electric power generation. The demonstration will be a commercial-size plant constructed and operated under realistic industrial conditions. The intent is to demonstrate to industry that electric energy can be generated economically from liquid-dominated geothermal resources in an environmentally and socially acceptable manner. Successful demonstration will reduce the uncertainties that attend the utilization of geothermal resources for power production and will thereby advance the realization of geothermal energy as an option for meeting national energy needs. The expression of interest is intended to obtain information about who is interested in geothermal exploitation and their capabilities for conducting a demonstration project.....The project will be located at a site where reservoir development work is already underway in order to accelerate geothermal development in the near term. The plant is intended to demonstrate commercial generation of electric power using a high-temperature, low-to-moderate salinity resource with a binary fluid, flashed-steam or a fossil-geothermal hybrid conversion cycle. Target date for power-on-line is 1982 or earlier.....Expressions of interest should be submitted to: Dr. James C. Bresee, Director, Division of Geothermal Energy, U.S. Energy Research and Development Administration, Washington, D.C. 20545."

USGS Geothermal Research Grants

Resource characterization, regional assessment, and exploration technology comprise the extramural component of the FY 78 U. S. Geological Survey Geothermal Research Program.

This component does not deal with site-specific studies to evaluate and confirm individual geothermal reservoirs nor with the technology to utilize geothermal energy. The USGS program is closely coordinated with the geothermal research, development, and demonstration program of the Energy Research and Development Administration.

Organizations interested in submitting unsolicited proposals to the USGS for geothermal research contracts or for grant assistance in FY 78 may request a brochure containing information about the technical program and about proposal preparation and submission from:

Geothermal Officer
U.S. Geological Survey
Branch of Procurement and Contracts
Mail Stop 205A, National Center
12201 Sunrise Valley Drive
Reston, Virginia 22092

Proposing organizations are urged to submit proposals by mid-December 1977 to ensure consideration during the next proposal-evaluation period. Requests for the information will be honored as they are received; to avoid delay, it is important to make requests early. It is anticipated that brochures will be ready for release by mid-September 1977.

Ocean Thermal Project

Three industrial firms have been selected by the Energy Research and Development Administration to design the first pilot system for generating electricity using the temperature differences of the ocean.

Contract negotiations will begin immediately with Lockheed Missiles and Space Company, Inc., TRW, Inc., and Westinghouse Electric Corporation Power Systems Company. Each firm will develop conceptual and preliminary designs for a 5,000-kilowatt electric power system designed to test the ocean thermal energy conversion (OTEC) concept.

The process involves pumping large amounts of warm surface water through heat exchangers, which in turn will evaporate ammonia; the vapor will turn a turbine-generator. Cold water, pumped from a depth of 3,000 feet, will cool and condense the vapor, beginning the cycle once again.

Currently ERDA is modifying a 300-foot barge in San Francisco to test individual components of the OTEC system. After completion of preliminary designs in September 1978, ERDA plans to select one or more of the designs for actual fabrication of a 5,000-kilowatt ocean-going pilot plant.

Information from both of these systems will be used to determine the size and configuration of later demonstration plants, the final step before commercialization.

Recent Developments

In the National Energy Plan, the President has proposed a tax deduction for intangible drilling costs comparable to that now available for oil and gas drilling. Furthermore, "Additional funding will be provided to identify new hydrothermal sources which could be tapped for near-term generation of electricity and for direct thermal use. The Government will also support demonstration of direct, non-electric uses of geothermal energy for residential space conditioning and industrial and agricultural process heat in areas where this resource has not previously been exploited."

Several amendments to P.L. 93-410 were passed by the House Science and Technology Committee on May 11, 1977, which enhance the Geothermal Loan Guaranty Program, (GLGP). Some highlights include:

1. Allows a guaranty to cover 75 percent of total costs of a nonelectric or self-generation project when located near a geothermal resource predominantly for the purpose of using geothermal energy if its economic viability is dependent upon the performance of the geothermal reservoir;
2. Raises the guaranty limits from \$25 million to \$50 million per project for non-electric applications and up to \$100 million for electric applications, and from \$50 million to \$200 million per borrower;
3. Allows interest differential payments for guaranties on taxable borrowing by states, municipal utilities or other political subdivisions of states, or Indian Tribes;
4. Pledges the full faith and credit of the United States to the payment of guaranties;
5. Allows interim payment of principal and interest to avoid defaults on worthwhile projects; and
6. Provides for borrowing authority by the Administrator to rapidly meet default payments.

On May 5, 1977, Cong. Goldwater introduced a bill entitled "The Geothermal Steam Act Amendments of 1977." A few of the highlights are:

1. Increases the per State acreage limitation on a geothermal leasehold from 20,480 to 51,200;
2. Provides a statutory scheme to ensure that geothermal leases will have access, on an equitable basis, to any transmission lines or rights-of-way for transmission lines on public lands in the general area of their leasehold; and
3. Provides for environmental assessments in phases on federal geothermal leases.

Competitive Lease Sale Action Schedule as of 07/27/77

The lease sale dates are those provided by the State Directors of ELM. Lease sale dates are tentative until public notice is issued 30 days prior to sale.

<u>Location of KGRA</u>	<u>Latest Sale Date Scheduled</u>	<u>Original Sale Date</u>
Geysers - Calistoga, CA	09/14/77	03/25/77
Rad. Sps, S. Ysd, Bac. Loc. 1, NM	09/20/77	05/25/77
Newcastle, Cov. Ft. Sulph, UT	09/27/77	09/01/77
Crat. Sps, Monr. Jos, Ther, UT	09/27/77	09/02/77
Randsburg, CA	10/14/77	05/06/76
Marysville, MT	10/27/77	04/05/76
Socorro Peak, NM	10/27/77	08/25/77
Wendel-Amedes, CA	11/15/77	01/20/77
Mt. Home, Raft River, ID	11/17/77	11/17/77
Salt Wells Basin, Brad-Haz, NV	12/13/77	02/16/78
Witter Springs, CA	01/18/78	01/21/77
Breitenbush Hot Sp. OR	03/09/78	07/14/77
Beckwourth Peak, CA	03/09/78	09/11/78
Geysers (Indian Val.), CA	03/09/78	09/15/77
Gerlach NE, Gerlach, NV	03/22/78	10/18/77

Fly Ranch NE., Trego, NV	03/22/78	12/13/77
Lovelady Ridge, CA	05/11/78	05/11/78
Lower Frisco, Gila Sp. NM	05/24/78	05/24/78
Belknap-Foley H. S., OR	07/06/78	07/06/78
Mt. Hood, OR	07/06/78	07/07/78
Saline Valley, CA	07/21/78	07/21/78
Double H.S., Elko H.S., NV	08/10/78	08/10/78
Glamis, Dunes, East Mesa, CA	09/21/78	08/17/78
Littlehorse Mountain, CA	09/21/78	09/21/78
McCredie, OR	10/05/78	10/05/78
Vulcan, ID	10/12/78	07/15/76
Mono-Long Valley, CA	10/18/78	04/15/76
Coso Hot Springs, CA	11/17/78	11/17/78
Carey Hot Springs, OR	01/01/79	01/01/79
West Yellowstone, MT	02/01/79	02/01/79
Lassen, CA	05/01/79	09/15/78
Mt. St. Helena, WA	01/01/80	01/01/80
Newberry Caldera, OR	03/01/80	03/01/80
Corwin Springs, MT	04/01/80	04/01/80

CONFERENCES

October 9-12, 1977: 52 Annual Technical Conference and Exhibition, Denver, CO. Titled "Energy Strategies" reflects the need for national policies to encourage efficient energy development. There will be 34 technical sessions and over 200 papers ranging from well drilling to geothermal reservoir operations.

January 31 - February 2, 1978: Geothermal Non-Electric Applications Symposium, San Diego, CA. The results of the ERDA sponsored Engineering and Economic Studies of Non-Electric Applications of Geothermal Heat (PRDA-DGE-76-1) and other selected recent work in the area of geo-heat utilization will be presented. For information contact: Geothermal Resources Council, P.O. Box 1033, Davis, CA 95616.

February 20-22, 1978: 5th Ocean Thermal Energy Conversion (OTEC) Conference, Miami Beach, Florida. This conference is presented by Clean Energy Research Institute, University of Miami, and sponsored by Energy Research and Development Administration School of Continuing Studies, University of Miami. This conference is intended for engineering and scientific research personnel in universities, government laboratories, industry and power companies whose work is related to the production of useful power, economically, from ocean thermal gradients.

February 24 - March 5, 1978: Volcanologic Field Trip to Guatemala, focusing on active volcanoes and young volcanic features of a converging plate boundary. Information: Jan Dunbar, Program Coordinator, Conferences and Institutes/EPCE, University of Nevada-Reno, Reno, Nevada 89557. Telephone: (702) 784-4046.

February 27 - March 1, 1978: 5th Energy Technology Conference and Exposition, Sheraton Mark Hotel, Washington, D.C. An exposition is featured along with the annual 3-day conference to introduce participants to a vast array of energy products, equipment, and services. For further information contact: Hal Crumly, ET5 Conference Director, Energy Technology Conference, Inc. 4733 Bethesda Avenue, N.W., Washington D.C. 20014.

PUBLICATIONS

California Division of Oil and Gas - New Imperial County Map - A new wildcat map (No. W1-8) covering Imperial County at a scale of one inch equals two miles has been published. The map will be most useful with the anticipated increase in geothermal activity in the Imperial Valley area. The area covered by the new map was previously included on map No. W1-7, but at a much smaller scale. New map No. W1-7 now covers only the area west of the Imperial Valley. The price of the new map is \$3.00 and is available from the California Division of Oil and Gas, 1416 Ninth Street, Room 1316, Sacramento, CA 95814, or through any of the district offices.

Battelle Memorial Institute - Published Papers and Articles: 1976 - The 36-page booklet lists the titles of the papers and articles, the names and dates of the publications in which they appeared, and the authors' names. Also, a list of patents issued in 1976 as a result of inventions by Battelle Staff is included. This information may be obtained by writing: Corporate Communications, Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio 43201.

Geothermal Energy in New England - By James R. Centorino. Includes author's field measurements of geothermal gradient in selected New England locations. It also includes general geothermal information. 150 pages, \$20.00, includes postage via book rate in the USA or Canada. J. R. Centorino, 71 Columbus Avenue, Salem, Mass. 01970.

Proceedings - International Congress on Thermal Waters, Geothermal Energy and Vulcanism of the Mediterranean Area (Athens, Oct. 5-10, 1976) - Volume I, Geothermal Energy (530 pages), \$10.00; Volume II, Thermal Waters (600 pages), \$12.00; and Volume III, Vulcanism (350 pages), \$8.00 (available October, 1977). Published by the Department of Mineralogy, Petrology, and Geology, National Technical University of Athens, 42, October 28th Street, Athens, Greece T.T. 147 - P.O. Box 1483, (postage included in price).

The Integrated Energy Vocabulary - This 450 page book, compiled by Battelle's Columbus Laboratory, lists more than 30,000 scientific and technical terms related to energy research and development. It enables persons to find the proper energy term or the right energy data base. Published by the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. \$22.50, NTIS order number is PB-259000.

"Economic Study of Low Temperature Geothermal Energy in Lassen and Modoc Counties, California" - This report identifies several industries that can be operated with heat produced by harnessing the energy of low-temperature geothermal wells in Lassen and Modoc Counties of California.

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