



GEO THERMAL

Hot Line

A publication of the State of California - Division of Oil and Gas

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1975 BUDGET U. S. GEOLOGICAL SURVEY

The U.S.G.S. has asked for \$230,871,000 in fiscal year 1975, or \$59,969,000 more than in fiscal 1974. The new budget includes \$25,300,000 for energy research and development. A \$10,064,000 portion of this budget is scheduled for geothermal energy investigations. This major effort is intended to accelerate research of geophysical, geochemical, and hydrological techniques for locating geothermal resources of all kinds; estimate the energy potential and longevity; evaluate individual "Known Geothermal Resources Areas" before leasing federal lands; and help select sites for demonstration power plants.

TWO FEDERAL LEASE BIDS REJECTED

The Secretary of Interior rejected two lease bids from the first geothermal lease sale of January 22, 1974. The two rejected high bids were for areas within the Geysers KGRA. Union Oil Company bid \$318,120.68 for Unit 7 (626 acres), an average of \$508.18 per acre; and Occidental Petroleum Corporation bid \$163,360 for Unit 9 (160 acres), an average of \$1,021 per acre. In his rejection on February 21, the Secretary ruled that these bids were too low and were below the Department of Interior evaluation of the units. The remaining 18 bids were accepted (see Hot Line, v. 4, n. 1, Feb. 1974). *M.J.R.*

BROADLANDS, NEW ZEALAND

On February 12, 1974, the New Zealand Ministry of Works announced that a new geothermal well is being drilled in the Broadlands area. The Ministry has been authorized to drill two wells this fiscal year and four more in FY 74-75. The wells will be up to 1200 m deep and will help to establish the potential of the Broadlands area.

IMPERIAL COUNTY, CALIFORNIA SUBSIDENCE DETECTION SURVEY

The second first- and second-order subsidence detection survey in the Imperial Valley will be completed by the end of April 1974. The Division of Oil and Gas has long recognized the possibility of surface subsidence caused by extensive withdrawal of fluids from the geothermal reservoirs, and has the regulatory responsibility for subsidence abatement. Working jointly with federal, state, county, and local agencies, the division coordinated the establishment and surveying of the network of subsidence bench marks that cover those areas in the valley where geothermal development is expected to take place.

The first general survey, conducted in the winter of 1971-72, was funded primarily by the U. S. National Geodetic Survey with contributions of funds and/or survey crews from the State Division of Mines and Geology, Division of Highways, Department of Water Resources, U. S. Bureau of Reclamation, Imperial County, and the Imperial Irrigation District. The second general survey, in the winter of 1973-74, was funded primarily by a grant from the National Science Foundation, with funds and/or survey crews being furnished by the National Geodetic Survey, U. S. Geological Survey, U. S. Bureau of Reclamation, State Department of Water Resources, Department of Conservation, Department of Transportation, Imperial County, and the Imperial Irrigation District.

The Imperial Valley is a tectonically active area and natural subsidence and uplift are occurring continuously. As most of the valley is a flat-lying, fertile plain with an extensive, elaborate irrigation system, subsidence could cause serious problems and lead to legal difficulties. The background data now being gained by the first- and second-order surveys will allow determinations to be made as to whether the subsidence is natural or caused by the production of geothermal fluids. *D.P.L.*

COMING MEETINGS

Special Short Course on Geothermal Regulations

The Geothermal Resources Council will present the second in a series of special short courses, "Geothermal Regulations" on May 23-24, 1974, at the Royal Inn, San Francisco (near the airport).

Space is limited, so the course will be held to 80 attendees on a first-come, first-serve basis. The cost will be \$100 per person. A study guide will be provided to each participant in the course. In addition, a limited number of study guides will be available for sale to those not able to attend.

Course Program:

JOSEPH W. AIDLIN, Magma Power Company: Development of geothermal laws and regulations, including discussion of the definition of the resource.

ROBERT CONOVER, Dept. of the Interior: Federal regulations and lease terms and their relationship to state laws and regulations.

SPEAKER TO BE ANNOUNCED: Geothermal reservoirs—fluid and vapor dominant, and hot rock.

RICHARD BOWEN, Oregon Dept. of Geology & Mineral Industries: Environmental problems related to geothermal development, an indepth study.

MARTIN TAFT, Consultant: Environmental impact statements including historical development, status, content, trends and recommendations.

HARRY HOWE, P.G.&E.: Power plant siting in California, including laws, regulations, power lines, and construction problems.

DAVID N. ANDERSON, Calif. Div. of Oil & Gas, Chairman; REPRESENTATIVES from the western state regulatory agencies: Panel on state laws and regulations.

L. H. AXTELL, Phillips Petroleum Co., Chairman: REPRESENTATIVES from various companies: Panel on regulations from operators' point of view.

DAVID N. ANDERSON and GLEN E. CAMPBELL, Calif. Div. of Oil & Gas: Drilling and completion practices from a regulatory standpoint, including abandonments, injection well programs, and blowout prevention.

For additional information contact Beverly A. Hall, Course Coordinator, P.O. Box 1033, Davis, CA 95616; (916) 758-2360, between 9:30 a.m. and 5:00 p.m.

Engineering Foundation Conference

The Engineering Foundation will sponsor a conference on Geothermal Energy to be held June 9 - 14, 1974 at the Asilomar Conference Grounds, Pacific Grove, California. The program will consist of 4 days of presentations and discussions dealing with geothermal energy systems and a summary session on the fifth day. Attendance is limited to 100 persons, and the fee is \$195 for registration, double occupancy room, and meals.

Conference Chairmen:

Jesse C. Denton, University of Pennsylvania
Donald H. Stewart, Battelle - Pacific Northwest Labs.

Program:

Sunday, June 9

Registration - Get Acquainted Session

Monday, June 10

Resource Exploration and Assessment

Tuesday, June 11

Reservoir Development and Production

Wednesday, June 12

Utilization Technology and Economics

Thursday, June 13

Environmental Effects and Institutional Considerations

Friday, June 14

Summary of Research and Development Needs

For applications and information, contact:

Engineering Foundation

345 East 47th Street

New York, New York 10017

UNION COUNTY, OREGON

Boise Cascade

On March 20, 1974, Boise Cascade's Timber Group announced that two new greenhouses are being constructed adjacent to a hot spring near La Grande, Oregon. The natural hot water will be utilized to heat the greenhouses through the winter months, providing a year-round growing climate for half a million seedling conifers a year. The controlled climate will produce growing stock two to three times faster than the conventional method where seedlings are raised in ground beds.

Boise Cascade will take advantage of the shortened growing period and low heating costs to mass produce trees to reforest large areas ravaged in recent years by the Douglas Fir tussock moth.

Weyerhaeuser Timber Company is presently raising seedling conifers in greenhouses in Washington and Oregon; however, fossil fuel is used for heating.

MAGMA - DOW AGREEMENT

On March 12, 1974, Magma Power and Magma Energy Companies entered into an agreement with The Dow Chemical Co. The agreement provides for Dow to acquire 650,000 shares of Magma Power (a 7% interest). Dow will make a \$5.2 million cash consideration payment with the stipulation that Magma will make available \$2.3 million of the payment for exploration in certain priority areas. Magma will also grant a non-exclusive license to Dow upon payment of certain considerations for the use of the Magmamax patent and the exchange of information and technology. In addition Dow has a three year option to acquire 236,500 shares of Magma stock at \$12 per share. Also two key Dow people will be elected to the Boards of Magma Power and Energy Companies.

Pursuant to the agreement several wells will be drilled, as soon as casing and equipment are available, to test four prime areas in California, Oregon, and Nevada.

U. S. GEOLOGICAL SURVEY OPEN FILE REPORTS

U. S. Geological Survey reports released in open file are available for inspection in the following U.S.G.S. libraries: 1033 GSA Bldg., Washington, D. C. 20244; Bldg. 25, Federal Center, Denver, Colo. 80225; and 345 Middlefield Rd., Menlo Park, Calif. 94025. Copies are available for inspection at: 1012 Federal Bldg., Denver, Colo. 80202; 8102 Federal Office Bldg., Salt Lake City, Utah 84111; 678 U. S. Court House Bldg., Spokane, Wash. 99201; 365 Federal Bldg. and U. S. Court House, (P. O. Box 036), Boise, Idaho 83702; Idaho Bureau of Mines and

Geology, Moscow, Idaho 83843. (Material from which copy can be made at private expense is available in the U.S.G.S. offices in downtown Denver, Salt Lake City, Spokane, and Boise).

1. Preliminary geologic map of the southern Raft River area, Cassia County, Idaho, by P. L. Williams, Kenneth L. Pierce, David H. McIntyre, and P. W. Schmidt. Four sheets, scale 1:24,000.
2. Residual magnetic intensity map of the southern Raft River area, Cassia County, Idaho, by the U. S. Geological Survey. One sheet, scale 1:24,000.
3. Bouguer gravity anomaly map of the southern Raft River area, Cassia County, Idaho, by Don R. Mabey and Carol W. Wilson. One sheet, scale 1:24,000.
4. Principal facts for gravity stations in the southern Raft River area, Cassia County, Idaho, by Carol W. Wilson and Don R. Mabey. Eight pages, including 7 pages tabular material.
5. Audio-magnetotelluric apparent resistivity maps, southern Raft River area, Cassia County, Idaho, by D. B. Hoover. Three sheets, scale 1:24,000.
6. Thermal data from heat-flow test wells near Long Valley, California, by J. H. Sass, A. H. Lachenbruch, and R. J. Monroe. Forty-six pages including 31 tables and 7 text figures. (Available only in Washington, D. C., Denver, and Menlo Park).

LIQUID FLUIDIZED-BED HEAT EXCHANGERS

Binary-cycle geothermal power plants may benefit from the use of liquid fluidized-bed heat exchangers. A demonstration facility to test the geothermal applications as been proposed by Allied Chemical Corporation, a contractor for the U. S. Atomic Energy Commission. Allied developed fluidized-bed heat exchangers to crystallize aluminum nitrate solutions in the separation of useful fission products from used reactor fuel.

The fluidized-bed has advantages in the control of silica scale from high temperature, water-phase geothermal wells. The bed particles are continuously agitated and have a scouring action on the heat exchanger tubes and wall surfaces. Silica scale forms on the bed particles (usually 0.2 to 0.3 mm quartz sand) and does not affect the heat exchange properties. Large tubes, (up to 2 m diameter) can be used for the geothermal fluid to allow high volume flow and to further reduce scaling. Fluidized-bed heat exchangers have a heat transfer coefficient up to 2.5 times that for an exchanger without the fluidized-bed. A mixed flow of steam and hot water is not expected to reduce the exchange of heat.

For further information contact:

B. C. Musgrave

Allied Chemical Corp.

Idaho Chemical Programs-Operations Office

P. O. Box 2204

Idaho Falls, Idaho 83401

M.J.R.

MONO COUNTY, CALIFORNIA

Casa Diablo Power Plant

The Southern California Edison Company reported it signed a letter of agreement in late March with Magma Energy Inc. to develop a geothermal energy electric generating station near Mammoth in the Casa Diablo Area of Long Valley, Mono County, California. The plant will be designed to generate 10,000 kilowatts of electricity and will cost Magma over \$3.5 million. Plant completion is expected in 1975.

Edison and Magma have jointly retained the Ben Holt Engineering Co. to prepare designs and cost estimates. It is contemplated that Magma will build the plant and sell energy to Edison.

GEOHERMAL ENERGY FILM

AV-ED Films of Santa Monica has announced the availability of a 14-minute, 16-mm film or video cassette in color titled *Geothermal Power*. Included are shots of steam fields and hardware in New Zealand, Mexico, and California (U.S.). For additional information, contact:

AV-ED Films

7934 Santa Monica Boulevard

Hollywood, California 90046

(213) 654-8197

ATOMIC ENERGY COMMISSION WASHINGTON, D.C.

"This Atomic Energy Commission has published a Draft Environmental Statement relating to its proposed liquid metal fast breeder reactor program (DES-WASH-1535 dated March 1974). Volume IV entitled 'Alternative Technology Options' is available upon request from the A.E.C. in Washington, D. C., and contains a forty-eight page assessment of geothermal energy alternatives. The A.E.C. has called for comments on its assessment by April 29, 1974." It would be to the advantage of those individuals and corporations working in the field of geothermics to review and comment on this section of the statement.

ARIZONA STATE LANDS WITHDRAWN

Phoenix, Arizona

On May 3, 1973, the Arizona State Lands Department withdrew all state lands in the Basin and Range Geologic Province of Arizona, with the exception of Santa Cruz County. The land will be withdrawn until a study can be made to determine the possible geothermal potential. The lands that are considered to have high potential for geothermal development will be put up for competitive bidding, all other lands will be released for noncompetitive bidding. The first lease sale should be held sometime this spring.

ANTOFAGASTA STATE, CHILE

El Tatio Field

Well No. 7 was recently completed as the first production well in the El Tatio Field. The well was drilled to 878 m, 38 mm casing was set at 600 m, and slotted liner was hung to the bottom. Bottom hole temperature is about 260°C and the shut in pressure at the well head is 22.5 bars. The well produces a mixture of steam and hot water and the flashed steam has an estimated power capacity of 6 MW.

Exploration and development in Chile is a joint project of the United Nations Office of Technical Cooperation and the Corporacion de Fomento de Chile. Separated steam from the production wells will be used by a 25 MW generating plant, and electricity will be marketed to the Chuquicamata copper mine, 80 km away (see Hot Line, v. 4, n. 1, Feb. 1974).

World Oil

JOINT VENTURE

Phoenix, Arizona

Geothermal Kinetics Systems (G.K.S.) Corp. announced on March 29, 1974, that they have signed a joint agreement with AMAX Exploration Inc., a subsidiary of American

Metals Climax Inc. to drill a series of wells in the western United States on land now held by G.K.S. Drilling is scheduled to begin in about 40 days.

WELL OPERATIONS

IMPERIAL COUNTY, CALIFORNIA

Heber Geothermal Resources Area

Chevron Oil Company, San Francisco, has filed notices of intention to drill three additional wells in the Heber area. Chevron's "J. D. Jackson" 1 is located 457 meters south and 317 meters east of the NW corner of Sec. 33, T. 16 S., R. 14 E., south of the town of Heber and about 777 meters northwest of its "Nowlin Partnership" 1. The "C. B. Jackson" 1 is located 341 meters south and 472 meters west of the NE corner of Sec. 32, T. 16 S., R. 14 E., southwest of the town of Heber and about 550 meters north of Magma's "Holtz" 1. The third well, "Hulse" 1, 716 meters south and 485 meters west of the NE corner of Sec. 29, T. 16 W., R. 14 E., is located west of the town of Heber and is about 747 meters west of Amerada's "Timken" 1, drilled in Sec. 28 in 1945 to a total depth of 2,233 meters.

Chevron, in a joint venture with Magma Power Company and San Diego Gas and Electric Company, is currently testing equipment and production and injection capabilities of the two Magma wells and the Chevron well that were drilled in the area in 1972 (see Hot Line, v. 4, n. 1).

BOX ELDER COUNTY, UTAH

Geothermal Kinetics Systems Corp.

Geothermal Kinetics has announced that their well near Crystal Hot Springs is now below 2,100 m. Drilling has been stopped to allow the running of logs and temperature surveys. Plans are to continue drilling to an, as yet, undetermined depth (see Hot Line, v. 4, n. 1).

The drilling will be done by the George Drilling Company.

Location: from the NE cor. 722 m. S, and 1509 m. W, Sec. 16, T. 10 N., R. 2 W., S.L.B.&M.

GILA COUNTY, ARIZONA

Nix Drilling Company

The Nix Drilling Company of Globe will drill a well on State of Arizona lands in the Safford Mining Area about eight km southeast of Ft. Thomas. The well will be located in Section 16, T. 5S., R. 24E., G.&S.R.B.&M. and is scheduled to be drilled to 600 m. Drilling should be underway by the middle of April.

This is the first and only geothermal lease on state lands in Arizona. It was awarded prior to the time that the State

decided to withdraw all State Lands from geothermal leasing (see article on Arizona State Lands Department, this issue).

LANDER COUNTY, NEVADA

Chevron Oil Co. - American Thermal Resources, Joint Venture

The Chevron-A.T.R. well "Chevron-ATR-Ginn" 1-13 in the Beowawe Area of Whirlwind Valley, Nevada (see Hot Line, v. 4, n. 1) is drilling below 2,460 m. To date no logs have been run or tests made. Drilling started in late January of 1974.

CHURCHILL COUNTY, NEVADA

Phillips Petroleum Co.

On April 1, 1974, Phillips spudded "Phillips and Southern Pacific Land Company No. 1-29 Desert Peak", Center SE1/4, Sec. 29, T. 22N., R. 27E., M.D.B.&M. The well is scheduled for 2040 m and is being drilled by R. B. Montgomery Inc. (Drilling Co.) of Bakersfield, CA.

Union Oil Co. - Magma Energy, Inc.

Union-Magma has filed with the state of Nevada to drill "S.P." 1 in Sec. 1, T. 22N., R. 26E., M.D.B.&M. The well will be five miles northwest of the Phillips well (see above) and is scheduled for 1,800 m. The well should be spudded in early April.

SONOMA COUNTY, CALIFORNIA

The Geysers Geothermal Field

Pacific Energy Corporation

On March 18, 1974, Pacific Energy abandoned "Bruno" No. 1, Sec. 14, T. 11N., R. 9W., M.D.B.&M., after reaching a total depth of 2,776 m. Compared to nearby wells the permeability of the subsurface units, with one exception, was very poor. The well was approximately 250 m southeast of "Rorabaugh" A-6, a producing well.

P.E.C. is preparing to drill "Rorabaugh" A-8 in the same section in the near future. Watch the Hot Line for location.

Geothermal Hot Line

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