THE SECOND UNITED NATIONS SYMPOSIUM
ON THE
DEVELOPMENT AND USE OF GEOTHERMAL RESOURCES
SAN FRANCISCO, CALIFORNIA
20-29 May 1975

The symposium is being organized by the United Nations Secretariat in cooperation with United States authorities (U.S. Department of the Interior; U.S. National Science Foundation; and U.S. Atomic Energy Commission), the State of California Resources Agency, and the University of California. In addition, the Geothermal Resources Council, the American Association of Petroleum Geologists, and public and private development corporations are providing assistance.

This symposium like its predecessor will undoubtedly be a landmark in the development of geothermal resources throughout the world and its proceeding, which will be rapidly published, will serve as a reference for years to come. This will be one of the rare occasions where all of the great and near-great names in the geothermal world will be in one place at one time. Attendance at this symposium will provide the exposure, contacts, and background that will be of use for years to come.

For additional information and a second circular containing registration forms, applications to submit papers, and pertinent information contact:

Symposium Coordinator
United Nations Geothermal Symposium
P.O. Box 7798
San Francisco, California 94120

If you are on the “Hot Line” mailing list, you have already received copies of the first and second circulars.

Please note: If you have not completed and submitted the registration form contained in the second circular and you plan to attend, please do so as soon as possible. Registration can only be accomplished by sending the form to the Symposium Coordinator.
THE GEOTHERMAL UNIT

In September 1974, the Geothermal Unit of the California Division of Oil and Gas was joined by Mel Schencong, Mel filled the vacancy created when Glenn Campbell resigned in June.

Milton M. Schencong
B.S. in Geology, 1961; Bowling Green State University
M.S. in Geology, 1963; Bowling Green State University
Navy flight, weather forecaster, 1953-57;
engineering geologist, California Department of Water Resources, 1963-70; oil and gas engineer, California Division of Oil and Gas, Inglewood and Santa Maria, 1970-74.

Specialties: engineering geology and water injection.

Lassen County Research Center

The Lassen Community College, in the city of Susanville, has announced the formation of the Geothermal Research Center under the auspices of the Lassen College of Engineering, Chico. The center will be housed in the science building now under construction on the campus.

The center's first director will be Philip W. Guzman, a founder of Hobo Wells Hydroponics, Inc., which is a firm active in raising tomatoes with geothermal heat at Wendel Hot Springs in Lassen County.

The center's first order of business will be to take an active role in the review of the Susanville Geothermal Energy Project, which involves a grant proposal to the National Science Foundation by C.S.L. Associates of Sacramento for the development of the geothermal potential in and near the city of Susanville.

For additional information on the center, call (016) 257-4101.

Geothermics Course

The International Institute for Geothermal Research of Pisa, Italy, will hold the Sixth International Post-Graduate Course in Geothermics. Beginning February 1, 1975, the nine month course will present theoretical lectures and seminars in Pisa, and practical geothermal training at specialized research centers and producing steam fields. Topics to be included are heat and thermodynamics, general geothemis, volcanism, hydrology and geophysics, geothermal systems, isotopic geology applied to geothermal research, reservoir engineering, geochemical and mathematical models, drilling technology, utilization of low and high enthalpy systems, and monitoring of production in fields.

For further information contact:
Instituto Internazionale per le Ricerche Geotermiche
Lunguomo A. Pacinotti, 55
56100 Pisa, Italy

California Geothermal Resources Board

The Geothermal Resources Board of the State of California held a two-day meeting in Sonoma County on August 4 and 9, 1974. The first day of the meeting consisted of a tour of The Geysers by the board, followed by a formal meeting in Santa Rosa on the last day.

The purpose of the meeting was to present oral and written testimony on the problems related to the development of geothermal energy in California and in particular The Geysers area. As a result of the meeting, the following recommendations to the Governor's cabinet for its consideration were made:

1. The state should provide a full-time on-site representative in The Geysers area for those state agencies with an interest in the area.
2. The state should develop Area Environmental Impact Reports dealing with environmental areas as the need arises.
3. The state Energy Policy pertaining to geothermal energy should be revised.

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County Contract for Inspections in the Geysers

Lake County has contracted with Rudsgen Engineers of Lakeport for inspection during surface operations of 5 wells in The Geysers area. The county public works department has contracted with Rudsgen Engineers for inspections and has assessed the geothermal operators for the con- trolling and monitoring of the county land use permit, as an inspector is present during the con- struction of drainage ditches, pads, su- perior roads, and attendant drainage facilities. The 3 use permits with this requirement are Buhmuller Oil & Gas (and Natconis) well "Davies Estate" 1 in Sec. 36, T.11.N., R.W., M.D.B.A.M., and Union Oil Co. well "Hooven 1", T.11.N., R.W., and "Chau Binkley" 1 in Sec. 36, T.12.N., R.W., M.D.B.A.M.

Sonoma County has attached a provision for inspection to land use permits for 2 Pacific Energy Corpora- tion located near areas of labiration. Environmentalist Consultants of Napa have been con- tracted to monitor compliance with the use permits. Of greatest concern to the inspectors are the provisions on water injection. The geothermal operator is assessed for the cost of the inspection.

Iceland Plans 50 MW Power Plant

Rodgers Engineering of San Francisco in cooperation with Thorolden and Partners Consulting Engineers of Iceland have been selected to design and build the plant. The project, to handle geother- mal work and Thorolden and Part- ners the civil engineering.

Rodgers Engineering, according to Jim Kuwada, has already begun work on the project which is to be a 50 MW plant, to discharge water at a tem- perature of 41°C. In a 2270 cubic meter holding tank, the water is cooled to 30°C before being supplied to the spawing tanks and raceways. The company hopes to be in full operation in 1976 with a production of 12,000 kg/week of processed catfish. Other products produced include smoked catfish, live fingerlings, and fish for stocking other farms.

Hot Fishing

A hardbound compendium of 17 to 20 papers presented at the conference will be published in about 6 months. See future issues of the "Hot Line" for release date.

U.S. Geologic Survey Grants

The U.S. Geological Survey has announced a geothermal research grants program involving the awarding of grants to industrial and small business concerns, non-profit geothermal research institutions, and other organizations having the capability for performing scientific research investigations of geothermal resources. Interested par- ticipants are invited to submit proposals for research projects pursuant to grants and contracts within the U.S.G.S.

Information may be obtained by requesting brochures from:
Don Klick
Geothermal Research
Mail Stop 906
2220 Adams Avenue
Reston, Virginia 22092
(703) 860-6531

Proposals must be submitted no later than January 15, 1975. Since this program is expected to be con- tinuing one, proposals received after this date will be considered for fund- ing support toward the end of fiscal year 1975, but only if funding is available.
**U.S. GEOLOGICAL SURVEY**

**OPEN FILE REPORTS**

The Geological Survey has released the following reports in open file. Copies are available for inspection in U.S.G.S. libraries: 12201 Sunrise Valley Dr., Reston, Va. 22092; Bldg. 25, Federal Center, Denver, Co. 80225; and 345 Middlefield Rd., Menlo Park, Ca. 94025. Extra depositories are listed with each report.


2. Preliminary geologic map of The Geysers steam field and vicinity, Sonoma County, California: Rept. 74-238, by Robert J. McLaughlin. Material for copying is available in the above mentioned California offices of the U.S.G.S. and California Division of Mines & Geology.

3. Report on direct current soundings over a geothermal prospect in the Bruneau-Grand View area, Idaho: Rept. 74-249, by Dallas B. Jackson. Material for copying is available at U.S.G.S. offices, Rm. 1012 Federal Bldg., Denver, Co. 80202; Rm. 8102 Federal Office Bldg., Salt Lake City, Utah 84111; Rm. 678 U.S. Court House, Spokane, Wa. 99201; and at Idaho Bureau Mines & Geology, Moscow, Idaho.


**NEVADA GEOTHERMAL REPORT**

The Nevada Bureau of Mines and Geology has published "Geothermal Exploration and Development in Nevada through 1973" by Larry Garside. This report is a description of the state geothermal potential with information on the exploration wells drilled (1920 through 1973) and the areas designated NGRA by the federal government. Copies of this paper (Report 21) are available for $1 each from:

Nevada Bureau of Mines and Geology
University of Nevada
Reno, Nevada 89507
Phone: 702-784-6691

**U.S. BUREAU OF MINE MATERIALS RESEARCH**

The Bureau of Mines, Electrometallurgy and Corrosion Lab, in College Park, Maryland, has been researching the materials problem associated with geothermal development. Laboratory experiments and field tests in the Salton Sea Geothermal Field led to two papers presented to the Electrochemical Society meeting this fall. The presentations were "The Solubility of Oxygen in Geothermal Brines" and "Corrosion Resistance of Some Commerically Available Metals and Alloys in Geothermal Brines". Construction is underway on several trailer-mounted test units and a portable laboratory for use in the Imperial Valley of California.

At a "materials workshop" meeting in College Park on December 3 and 4, problems facing the geothermal industry were presented and needed research was discussed. Future work will try to solve the problems of corrosion of casing in saline brines, scales of surface pipes, and turbine blade corrosion.

**NEW GEOTHERMAL EXPLORATION GROUP**

A group comprised of AMAX Exploration Inc., LVO Corp., Earth Power Corp., and Thermal Resources Inc. has been formed to explore and possibly develop geothermal properties in Oregon and two in Washington. AMAX is to execute all surface exploration prior to 1976.

"Leases and lease applications involved cover 112,000 acres in Malheur, Lake, and Harney counties in Oregon, and Skamania and Lewis counties in Washington."

Petroleum Engineer

**EXPLORATION IN NICARAGUA**

A joint Nicaragua - United Nations geothermal project has progressed to the stage of exploration drilling. The prime area of interest is the valley between the volcanoes Momotombo and El Oyo, a short distance northwest of Managua. It is possible that the two cones are fed from the same magma chamber which may lie beneath the valley. Four exploratory holes will be drilled to depths between 550m and 915m (see also "Hidro Line") v. 4, n. 1, Feb. 1974.

**U.S. GEOLOGICAL SURVEY GEOTHERMAL BUDGET**

The U.S. Geological Survey has been given an appropriation of $10,861,000 for geothermal investigations in the current fiscal year (to June 30, 1975). This is an increase of $7,914,000 over last year. A major effort will be aimed at developing useful exploration methods to locate geothermal resources. Also of high priority will be the development of methods for evaluating individual fields as to size, energy potential, and longevity. The U.S.G.S. is involved in continuing projects to estimate the national potential of geothermal resources and to evaluate the federal lands being leased for private exploration and development.
TEMPERATURE GRADIENTS IN GEOTHERMAL SYSTEMS

A knowledge of the temperature and pressure at any depth in a geothermal system is important for the exploration and development of the system. The boiling curve defines the physical limit of temperature and pressure for any liquid or two-phase reservoir. Geothermal fluids are usually similar to water solutions of sodium chloride. The explored geothermal fields may vary in concentration from less than 0.2 weight percent (Hveragerdi, Iceland) to over 25 weight percent (Salton Sea field, California).

Boiling point curves are presented here for pure water and for 10 and 25 weight percent sodium chloride solutions. Calculation of these curves is based on the mathematical model of John L. Haas, Jr. (1971, Econ. Geol., v. 66, p. 940-946). The curves are for a constant composition of the fluid, but in natural systems the concentration usually increases with increasing depth and temperature. The model assumes a hydrostatic column of water for the calculation of pressure; however, in geothermal systems there may be pressures greater than hydrostatic, and water may be moving in convection cells.

The density of water decreases as the temperature increases. The following are calculated densities for high temperature solutions (Haas, 1971):

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M.J. REED
HOTLINE, VOL. 4, NO. 4

NEVADA FEDERAL LEASING

More than 12,000 acres in the Brady Hot Springs area of Churchill County, Nevada were put up for bid September 11, 1974 but there were only 6 bids on 5 of the leasing units, and offers were low. Southern Union Production Company submitted the top bid, $15,168, for 1 unit. Geothermal Resources International offered bids for 2 units at $6,500 each and another at $1,000. Magma Power Company bid $5,993 for 1 unit but it was not accepted.

In the second federal lease sale for Nevada, held December 19, 1974, bids were made on 2,603.16 acres with the total high bids of $1,001,058.74. High bids for the leasing units were the following:

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The next federal sale in Nevada will be April 8, 1975 for the Fly Ranch and Double Hot Springs K.G.R.A.'s in northwestern Nevada. It is expected that the first non-competitive lease in Nevada will be issued the first week in January, 1975.
CALIFORNIA GEOThermal LEGISLATION

Following is a brief summary and status of the more important bills pertaining to geothermal energy development. The bills were submitted during the last two year session of the California legislature. Although most of the bills had a short life, they serve to indicate some of the problem areas in the field of geothermal energy development.

**SENATE BILLS**

No. 562 Senator Dills, March 28, 1973
Eliminates the value of geothermal resources from the assessment of land at full cash value, for purposes of property taxation. Contains mechanism for determination of property tax revenues that would be lost. Status Approved by the legislature and signed by the Governor.

No. 2902 Senator Dills, April 15, 1974
Changes existing state law pertaining to prospecting permits, leasing, and royalty rates on state lands and increases the membership and adds to the duties of the Geothermal Resources Board. Status Referral to interim study. A revised bill will be submitted by Senator Dills in the 1976 session of the legislature.

**WELL OPERATIONS**

SANDOVAL COUNTY, NEW MEXICO
Los Alamos Scientific Lab
The Los Alamos Scientific Lab operating on a contract from the U.S. Atomic Energy Commission completed drilling on their second test well for “hot dry rock” in September, 1974. Well GT-2 is in the Santa Fe National Forest on the Jemez Plateau of New Mexico at a distance of 30km north of Los Alamos. Drilling reached a total depth of 2042m, and the well was completed with 34cm casing to 488m, 27cm casing to 773m, and a 25cm open hole to total depth. Although the surface temperature gradient was high, the maximum temperature in the well was only 140°C. The rocks in the area consist of Paleozoic rhyolite at the surface, Paleozoic sediments to a depth of about 600m, and a Precambrian basement of granite, amphibolite, and biotite schist. Large water bearing fractures occur between 900m and 1080m. Experiments in hydraulic fracturing of the rock are planned for next year (see also “Hot Line” v.3, n.7, Dec. 1975).

CHURCHILL COUNTY, NEVADA
Chevron Oil Co.
Chevron Oil Co. is drilling well “Chevron-Phillips” 1-29 in the Soda Lake - Stillwater KGRA. The location is 20m north and 20m west from the northeast corner of Sec. 29, T.20N. R.23E. M.D.B. & M. Surface casing has been set at 307m, and drilling continues to a total depth of about 1830m.

MODOC COUNTY, CALIFORNIA
American Thermal Resources
American Thermal Resources spudded a wildcard geothermal well, “Grande 1” in SW1/4, SE1/4 of Sec. 1, T.12S. R.13E, M.D.B. & M., which was drilled at an elevation of 1731m. High-head fresh waters in the upper 300m of the hole showed penetration rates and caused difficulties in cementing operations, but after cementing the 24m casing at 60m penetration rates increased markedly. The well was abandoned on Dec. 19, 1974 at a total depth of 2153m.

MENDOCINO COUNTY, CALIFORNIA
Sun Oil Co.
Sun Oil Co. is drilling a geothermal exploration well “Moccasin-1” in southeastern Mendocino County approximately 946m north and 1132m west of the southeast corner of Sec. 13, T.12N., R.16E., M.D.B. & M., at an elevation of 484m. The well is about 2km north of Sun’s well “Foresch-Ferro” 1, drilled and abandoned in 1972 by Cordero Mining Co.

IMPERIAL COUNTY, CALIFORNIA
Brawley Union Oil Company of California
Union Oil Company of California has filed with the state, notices of intention to drill five geothermal test wells on the Brawley anomaly. The proposed wells are Los Vinos, T.5S., R.14 E., M.D.B. & M., and are:

1. “Jiminez” 1, Sec. 15 - approximately 274 m S. and 564 m W. from NE corner.
2. “Benson” 1, Sec. 16 - approximately 155 m N. and 594 m E. from SW corner.
3. “Cox” 1, Sec. 15 - approximately 564 m N. and 157 m W. from SE corner.
4. “Veysey” 1, Sec. 15 - approximately 472 m N. and 107 m E. from SW corner.
5. “Veysey” 2, Sec. 21 - approximately 343 m S. and 267 m W. from NE corner.

These proposed wells are located 3 to 4 km north of the town of Brawley and about 2 km south and east of Amadit Ranch “Veysey” 1, which was drilled as an oil prospect in 1945 to a total depth of 2540m and found which abandoned high subsurface temperatures while drilling.

These new locations of Union’s are near the center of the geothermal gradient anomaly reported by the U.C. Riverside - Bureau of Reclamation study published in 1972 and will be the first geothermal test of the Brawley KGRA.

D.P.L.

Heber Area
Rep. Geothermal

Republic Geothermal, Inc., Whitter, California, has filed notices with the state to drill three wells in the eastern portion of the Heber KGRA. The proposed wells are “Little” 1 & 2, twin wells located in Sec. 33, T.16S., R.15E., S.B.B. & M., and “Bobbangle” 1, Sec. 32. The two “Little” wells will be drilled 30 meters apart; one is intended to be used as a shallow injection well and the other is programmed as a producer. The wells are located on one of the geothermal gradient “hot spots” discovered as a result of the U.C. Riverside - Bureau of Reclamation shallow temperature hole survey the results of which were published in 1973. The area being investigated is located about 6 km (4 miles) northeast of Calixcro and about 10 km (6 miles) east of the Heber geothermal area in which the Chevron Oil Company is currently conducting productivity, injection and equipment tests on five wells (see “Hot Line” Vol. 4, n. 3 June 1974).

M.M.S.

Salton Sea Geothermal Field
Geo-Energy Systems, Inc.
Geo-Energy Systems, Inc., Los Angeles, has filed with the state, a notice to drill a geothermal test well, “Rudie” 1, in Sec. 12, T.12S., R.13 E., S.B.B. & M. This proposed test is located about 4 km east of production in the Salton Sea Geothermal field and is about 9 km from the 4-1/2-M.D.B. & M. The well will be drilled under the supervision of Rogers Engineering Co., San Francisco, and is designed to test the patented heat transfer system called the Van Huisen Downhole Heat Exchanger. This device is designed to extract heat from the geothermal reservoir without producing any of the fluids from the reservoir, thus avoiding the corrosion and scaling problems encountered with production in this area.

D.P.L.
Merry Christmas and Happy New Year

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(916) 445-9686

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DIVISION OF OIL AND GAS
1416 NINTH STREET, ROOM 1316-35
SACRAMENTO, CALIFORNIA 95814