

Within 20 years the heat near New Mexico's surface may provide 30% of our space heating, plus make a contribution to electricity.

UNIVERSITY OF IITAM
RESEARCH INSTITUTE
EARTH SCIENCE LAB.

AREA
NM
Gthm

Geothermal: hot energy for the future

by Chandler Thompson

Warming one's toes in the rivulet running along the west side of State Highway 4 at the Soda Dam north of Jemez Springs has been for many years a common example of the use of New Mexico's geothermal resource. The warm water seeping from the rocks of the Jemez Mountains carries the heat of the earth's molten core. The warm water soothes; bathers in hot springs from Jemez to Truth or Consequences have known that for years. When our fuel-short nation started thinking about alternate energy sources, the first consideration was electricity. The idea of turning btu's of the earth's heat into megawatts remains an appealing option. The Baca Geothermal Demonstration Project, a 50 megawatt power plant being developed in the Valles Caldera near Los Alamos is the state's biggest geothermal project. (See accompanying story.)

The geothermal resource, itself either hot water or hot rocks, becomes accessible because in the course of the earth's geological evolution events sometimes placed the hotter part of the core much closer to the surface than normal. This interior heat percolates to the surface all over the world. But where the earth's outer skin remains more thin, this heat remains more concentrated when it reaches the surface. Where the surface of the earth is closer to the heat, the surface itself is hotter, a reasonable expectation, giving geologists—and children—clues to the location of the resource.

In addition to the power plant application, direct use of the energy in hot groundwater for such applications as indoor space heating and water heating has now emerged as a possibility many experts think will alter the state's energy future dramatically.

"We're further along on this low and moderate temperature utilization than just about anybody in the country," says Albuquerque geologist Bob Grant. The former state legislator, who has done extensive geothermal research as a

Warming the toes:

This small boy is enjoying the soothing water that drips from the rocks near the Soda Dam on State Highway 4. The warm water is New Mexico's geothermal resource. More productive uses for the resource are coming—from space heating to producing electricity.

private consultant, is especially enthusiastic about developments around Las Cruces and New Mexico State University. "It isn't like they're still speculating that the resources may be there," he stresses. "They've already found them."

Grant's activities include tracking the progress through the U.S. Congress of proposed geothermal legislation that could benefit New Mexico considerably more than most other states. Title VI of Senate Bill 932 calls for a loan guarantee program that Grant said would permit "qualified private citizens, corporations, municipalities or just about anybody" to apply for direct federal loans covering up to 90% of the cost of geothermal exploration, drilling and development. According to the terms of Title VI, no repayment schedule would be set up until a project proved successful.

In addition to the loan guarantees, S.B. 932 envisions a state-coupled user assistance program with Washington setting aside some \$30 million in the 1981 fiscal year for joint venture projects. As partners with state, local or private entities, the feds would assume up to 90% of the risk associated with finding geothermal resources and putting them to work. The \$600 thousand the New Mexico Legislature earmarked for geothermal demonstrations in its February session much enhances the state's prospects for using this incentive to reduce dependence on fossil fuels.

In fact, New Mexico has made the business of using state dollars to lure federal funds and stimulate private development something of an art form over the past half decade. Beginning in 1974, the legislature has made money available through what is now the Energy and Minerals Department for geothermal exploration, resource assessments, feasibility studies and demonstrations. The result has been the statewide geothermal program administered by the New Mexico Energy Institute at New Mexico State University (NMEI-NMSU) in Las Cruces.

The commitment to geothermal development at the state level has attracted national attention. NMEI-NMSU is now in its third year as lead agency for federally sponsored operations research in the ten states of the Rocky Mountain Basin and Range Region. This amounts to a major commitment to organizing the resource


and potential market data needed to think intelligently about commercialization and then putting the findings in the hands of both public and private decisionmakers. Other Institute activities that have received federal support include a statewide low temperature resource assessment program and a project that compiled an overview of the environmental implications of geothermal development in New Mexico.

Dr. Harold A. Daw, Acting Director of NMEI-NMSU, says Las Cruces' experience with geothermal "started with indications of something unusual in a well drilled many years ago in the Las Alturas area" east of the campus. Then, in the late '70s, "geophysicists started doing electrical resistivity work and drilling shallow temperature gradient holes." These techniques make it possible to locate underground heat sources by measuring heat increase with depth and by charting areas of low electrical resistance, a phenomenon closely associated with high temperature zones.

Prospecting for hot spots in this fashion gave researchers an idea of where they should sink test wells in December 1978 and January 1979. The hotter of these two probes found 145°F water at depths around 1000 feet and thus justified the sinking of two production wells in the latter half of 1979.

The first production well, one of six projects to receive state geothermal demonstration funds in 1979, will supply energy for hot water and space heat in the NMSU University Center Complex now under construction. The President's Well—so called because the new facility will include living quarters for NMSU's chief executive—should provide highly visible proof of how a previously untapped resource may be put to effective use. At present, the 500-foot shaft is fitted with a pump that draws 17 gallons of water per minute at 118°F.

The 5,280 square foot University Center overlooks the NMSU campus from the east, just a short distance from the school's active and passive solar demonstration houses. Mechanical equipment will include air conditioning and a standard, off-the-shelf heat pump adapted to use hydrothermal energy. A reinjection well to pump cooled water back into the ground will round out the system. Due for completion in September, the facility will become a

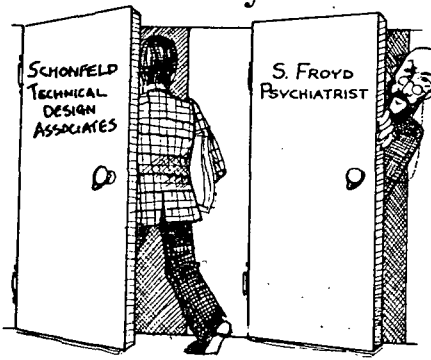


TENNIS RANCH of TAOS

- Luxurious Accommodations
- Condominiums For Sale or Rent
- Adult and Junior Clinics
- Six Outdoor/Two Indoor Tennis Courts
 - Pro Shop
 - Heated Pool, Sauna & Jacuzzi
 - Continental Cuisine

For Information Write or Call:
**Tennis Ranch of Taos,
 Drawer BBB
 Taos Ski Valley Road,
 Taos, New Mexico 87571
 (505) 776-2211**

Are Your Electronic Design Problems Driving You Crazy?



There IS An Alternative

Schonfeld Technical Design Associates

Analog, Digital and Microprocessor Hardware Design Systems and Applications Software Design.

5100-B Indian School, N.E.
 (505) 255-9283

regular stop on the alternate energy tour NMSU offers interested visitors.

The second production well is 860 feet deep and in pump tests has produced 200 gallons of water per minute at 140°F. Current plans call for it to be used as a source of heat for the campus's hot water supply. Engineer Roy Cuniff, who has charge of implementing these plans, estimates NMSU's natural gas bill for water heating should drop 75%. Indications are that a project to reach this level of substitution will cost close to \$1 million. About a third of the money is already in the pipeline from the New Mexico Energy and Minerals Department and the U.S. Department of Energy. NMSU officials are optimistic about getting the rest from federal sources as well.

Daw points out that the school's geothermal work has implications that stretch well beyond the campus. "What was once called the Las Alturas Anomaly now would be better described as the Las Cruces Anomaly," he says. "We have strong indications from (water) wells put down east of the city that there is roughly six miles of known area that is hot, (and) the hottest of the prospects found so far is way over on the north side of the city. It looks better at the moment than anything on the NMSU campus.

"We're planning in the very near future to hold a conference with private industry, building contractors and (others) to acquaint them with the status of geothermal in this area. Following that, we'll have a much better notion of how people are looking at the matter and just where we can go."

There's reason to think New Mexico could go far with its low temperature geothermal reservoirs. The Rio Grande Rift, which parallels the river's course down the middle of the state, is a vast geologic fault system that allows heat from the earth's core to rise conveniently close to the surface. Thus, many of the state's major population centers sit atop what some geologists like to call a tame volcano. The dispersed demonstration projects financed by the New Mexico Energy and Minerals Department last year dramatize this stroke of fortune rather clearly. Sites range all the way from Taos in the north to Las Cruces and Silver City in the south.

George Scudella, who helps oversee the demonstration program for the Energy and Minerals Department, admits that some projects have hit snags. However, most problems are of the institutional or procedural variety that are bound to afflict a new approach to almost anything. In Taos, for example, Solar America, Inc. must resolve a series of water rights issues before proceeding with construction of a hybrid solar-geothermal greenhouse.

Farther down river, Scudella says, all the engineering and planning work is

complete on a project to retrofit the Truth or Consequences Senior Citizens' Center with a geothermal heating system. As soon as the state Oil Conservation Division issues the necessary permit, drilling will begin on what is expected to be a 500-foot production well. T or C's Carrie Tingley Hospital for Crippled Children received a \$55,000 federal match in early March for \$46,000 in state money. Plans call for pre-heating water in the hospital boiler system with thermal waters already used to feed a therapeutic swimming pool.

Construction is currently under way on a geothermal greenhouse for the Southwest New Mexico Center for Handicapped Children and Adults in Silver City, a project on which Scudella waxes eloquent. "This is a greenhouse to grow native plants for reclamation of copper tailings by crippled adults and children," he says, "and a major portion of the match was supplied by community fundraising, bake sales and things like that."

Just south of Las Cruces, Monument Solar Corporation has completed a geophysical analysis of the area around

If the price rise in the price of a barrel of oil averages 5% a year over the next two decades, the potential yearly savings to New Mexico consumers would be in the neighborhood of \$1.7 billion.

the L'Eggs hosiery plant and is now looking at possible sites for drilling. The project, if successful, will provide industrial process heat for drying and dyeing operations in the L'Eggs factory. Sandyland Nurseries next door is also looking into ways to use geothermal heat in its greenhouses and has given some thought to a project in tandem with L'Eggs. Clive Ashton, General Manager of Sandyland, says his firm definitely plans to drill a geothermal well of some sort since, given today's energy prices, the cost of doing so would not differ greatly from a month's utility bill.

In the private sector, entrepreneurs are beginning to look at hot groundwater for ventures considerably more ambitious than the mineral baths and spas that have been its prime users in the past. The Sandia Savings Building in Albuquerque is now outfitted with a geothermally augmented heat pump that carries the entire energy load for indoor climate control and water heating. Commercial greenhouses using geothermal heat are in operation near Lordsburg in the state's extreme southwest corner and just outside the village of Jemez Springs in the north-central area. At least one Truth or Consequences motel also features a geothermal heating system.

One indicator that the trend to direct heat applications will continue to grow is the NMSU Energy Institute's low temperature resource assessment work. Between 1977 and 1979, researchers revised the number of suitable sites in New Mexico upwards from 5 to 55, and this figure fails to reflect such recent developments as the exploration for geothermal resources that could be used in the international industrial park now under construction at Columbus-Las Palomas south of Deming. (*Business Journal*, January 1980.)

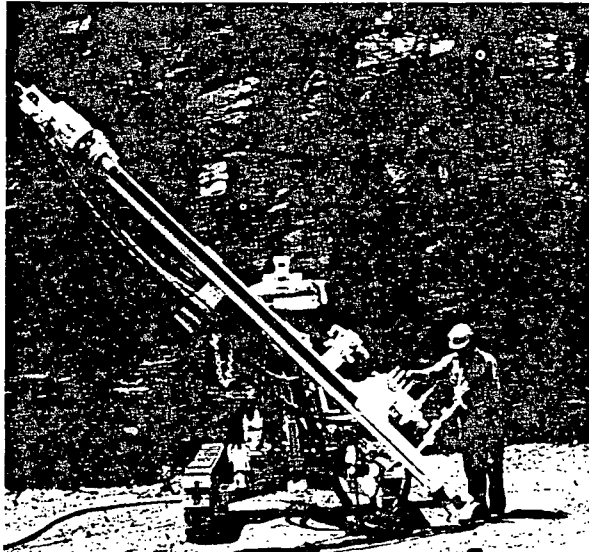
Meanwhile, NMSU is not the only university likely to be getting its heat from underground in years to come. NMEI-NMSU funds have also supported studies to measure the feasibility of similar conversions at the New Mexico Institute of Mining and Technology in Socorro and at the University of New Mexico and the University of Albuquerque. All three schools are within reach of usable resources, and UNM researchers are particularly impressed by heat sources west of Albuquerque. Since much of the city's growth is towards the west, they think that low temperature geothermal will become an increasingly attractive option for new construction as conventional energy costs continue their ascent into the stratosphere.

The job of peering into the future and projecting what it will bring to the geothermal energy scene belongs to the NMEI-NMSU operations research team and its collaborators from the school's Physical Science Laboratory and Center for Business Services. In answer to queries, researcher Mark Houldsworth replied that looking "at the year 2000 only, we show a potential penetration of the total space heating energy demand in New Mexico of about 30% by geothermal." That, he went on to say, would "involve roughly 11,875,000 barrels of oil per year displaced." If the rise in the price of a barrel of oil averages 5% a year over the next two decades, the potential yearly savings to New Mexico consumers would be in the neighborhood of \$1.7 billion.

In a sense, Chandler Thompson of Las Cruces "wrote the book" on geothermal energy in New Mexico because when he was with the New Mexico Energy Institute he served as the technical writer for the Institute's publication, The Geothermal Option, A Choice for New Mexico. Now, with his wife Marisela, he runs Southwest Language Services, which provides translation service for the growing commercial traffic between Mexico and the United States.

Subsequent articles will talk in detail about the technical problems of using the geothermal resource to produce electricity and the institutional and environmental constraints on the use of geothermal.

IR Ingersoll-Rand



**NEW!
CM-351
Crawlair drill**
The compact,
powerful mobile rig
for drilling 64-140mm
(2½-5½") blastholes.

Piston-type air feed motor provides 1362 kg (300 lb) of pullout power. Exhaust muffler reduces noise of drifter drilling. Steel rack (optional) holds three 3660mm (12') drill steels. Hydraulic guide extension with 1.2m (4') stroke adjusts for firm ground contact. Hydraulic cylinders provide finger-tip control of boom swing, boom lift, guide tilt, guide dump. Rugged Track drive and disc brake design. Each track is independently driven by an 11.4-hp piston-type air motor with enclosed gearing and spring-applied, air-released disc brakes. Hydraulic track oscillation uses controlled fluid flow to cushion oscillating movement and minimize shock loads when tramping over rough ground. Dust control options include Vapospol water mist injection system or a self-cleaning dry-type dust collector.

107 Candelaria N.E.
Albuquerque, N.M. 87107
505/345-7811

State Highway 53 North
Grants, N.M. 87020
505/287-8889

IR Ingersoll-Rand

IR Ingersoll-Rand

IR Ingersoll-Rand

WHEN A COMPANY CARES, IT SHOWS.



Molycorp Environmentalist examines a portion of more than 200 acres of land seeded with natural grass as part of the program of perpetual restoration to a natural state of land affected by mining operations. This year the company is spending \$1,250,000 in environmental endeavors, including work on the tailings dam, new and enlarged tailings pipe, and revegetation of land.

Molycorp, Inc.

Questa, New Mexico