Geothermal drilling feared to be threat to Yellowstone

Los Angeles Times

YELLOWSTONE PARK, Wyo. — A trapper, John Colter, wandered through this region a century ago and was startled by the display of whooshing gases, erupting steam and multi-colored pools of lava. He returned to civilization and reported the "viry spektaculer" natural events he had seen. No one believed him.

They should have. This year more than 2 million people will come to stare and wonder at Old Faithful geyser and the other thermal freaks that fume along the high plateaus of this park. Yellowstone has become one of the premier scenic attractions of the world.

But the National Park Service has warned in a memorandum that the future may hold considerably less whooshing and fuming for Yellowstone. The potential villain, the park service said, is a proposed geothermal development running along the park's western border.

GEOTHERMAL energy, or underground steam, is used much as man-made steam is used to generate electricity. Now used commercially only in California and several Western states, geothermal energy in recent years has been the object of an intensified development program by the federal government.

The Yellowstone area long has been a favorite prospecting ground for geothermal engineers. But, the Park Service wondered what would happen if geothermal reserves outside the park contained subterranean links to those inside? With a drain in underground pressure, the agency concluded, Old Faithful and its thermal cousins could become a casualty of the country's energy crisis.

"I don't think we are so poor a nation that we need to diminish some of the most extraordinary features of the earth to deal with the energy issue," John Townsley, Yellowstone's superintendent, said.

THE RECENTLY proposed project, known as the Island Park Geothermal Area, covers a range of gently rolling forests and low mountains in the Targhee National Forest of Eastern Idaho. In its heart lies the Island Park caldera, the collapsed cone of a volcano presumed to be the source of the geothermal heat.

Earlier this year, the United States Forest Service began an environmental review of the proposal, which now includes 145 applications for development. The applications would place geothermal wells as close as 10 miles to Yellowstone's midway geyser basin.

In spite of the proximity, industrial geologists scoff at the park service's fears, arguing that Island Park and Yellowstone represent two different geothermal formations.

MALCOLM Mossman, geologist for Occidental Petroleum Company, said his company's studies showed the areas were separated by thick rock walls.

"This whole thing is a little bit dingie," Mossman said. "The Park Service is suffering from an overabundance of ignorance about the possible connection between Island Park and Yellowstone."

Both the Forest Service and the Park Service said that the small amount of geological research conducted at Island Park was insufficient to determine whether a connection existed. But the Park Service maintains that past attempts to mine geothermal heat near geyser fields has produced disastrous results for surface activity.

According to the Park Service memorandum, the Geyser Valley region of New Zealand was ranked fifth among major geyser areas of the world until the Wairakei geothermal field was developed two decades ago. Since then, the geyser field has been destroyed. "In addition," the park service document said, "production from Wairakei also affected another thermal area thought to be independent with no connection" to the geothermal field.

SIMILAR RESULTS were obtained after geyser fields in Nevada were tapped for steam production, the memorandum said. In fact, it concluded, only three of the world's 10 major geyser areas at present remain in an undisturbed state. Of those, Yellowstone is by far the largest.

The threat to Yellowstone has stirred the Park Service and local citizens. In the Old Faithful Times, a tourist-oriented newspaper published in West Yellowstone, a recent editorial lambasted the geothermal companies' "bureaucratic deviltry" in general, and ended with this salvo:

"Even now, one can hear the dim, distant swish of the Grim Reaper's dreaded scythe being swung by the National Forest Service.

"Alamo! Maine! Pearl Harbor!

"Our voice rises on the wind calling loud to the whole world ...

"Remember Old Faithful!"

IN SPITE of the concerns expressed in its memorandum, the Park Service has shrunk from outright opposition to the geothermal development. One Park Service official, speaking of "political realities," said the agency instead would emphasize a monitoring program to detect minute changes in geothermal pressures.

Such a program, measuring conditions at the surface and thousands of feet down into the geothermal zone, presumably would allow the Park Service to foresee and forestall changes before they affected vulcanism in the park.

"Monitoring is the key issue," Superintendent Townsley said. "Our aim is to make it very precise and to have independent scientists running it. I don't think we would be comfortable with industry people operating the controls."

THUS FAR, LITTLE is known about Island Park or its subterranean links to the park's geology. But, though the area has been marked for its geothermal potential since 1974, neither the government nor industry geologists has been able to estimate its energy potential.

With present technology, geologists say, effects on Yellowstone are impossible to predict before drilling beings. Such effects, or their absence, can be detected only after the wells are drilled and steam pressure from Island Park released.

It is known, however, that geysers are particularly sensitive to change. A geyser erupts after the water collected in a labyrinth of underground channels becomes superheated in its pressurized environment. Bubbling and splashing at the surface reduces the pressure and the water flashes into a furious boil. The boiling then roars through the deep labyrinths, pushing the water upward into a plume at the surface.

BUT IF THIS delicate balance of heat, water and pressure is altered, the cycle that creates eruptions can be destroyed. According to the Park Service, the geysers that have been destroyed in other parts of the world have never recovered.

The Forest Service environmental review of the Island Park project is scheduled for completion this fall. If the agency recommends development, the issue then goes to the Department of Interior for a final decision.

Should development take place with a monitoring program, the cost could be high. Industry geologists estimate that monitoring wells would cost roughly the same as producing wells and, taking inflation into account, the figure could reach $150 to $200 a foot at Island Park. Thus, for a 5,000-foot monitor well, the price could reach $1 million.

Park Service officials said they expected the program would be designed so that industry would bear the monitoring costs. In any event, they said, the vulcan spectacles of Yellowstone are worth the expense of protecting.

"They are extremely rare and beautiful," Alan Mebane, the park's chief naturalist, said. "They thrill everyone who sees them, and they are worth keeping around."

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Great Utah Potential

Geothermal Power Use Gaining

By Robert H. Woody
Tribune Business Editor

Oil—and nuclear power—have made it big in the news these days.

Mr. Woody

But the news was not pleasant: A shortage and higher prices for one, and unplumbed lethal implications for the other.

Another energy source — geothermal was upstaged.

However, the U.S. Geological Survey estimates a potential of 2,400 quads of energy exists in the nation's geothermal systems.

A quad is a quadrillion British Thermal Units.

Only 80 This Year

U.S. consumption of geothermal energy, principally at the Geysers Field near San Francisco, will only amount to 80 quads this year.

According to Utah Geological and Mineral Survey specialist Carlton Stowe, the USGS estimate of potential geothermal energy for the nation means that some 95,000 to 150,000 watts of electricity might be producible from geothermal water.

At least 230 to 350 quads of energy might be available for heat applications.

The Geysers field produces 608 megawatts of electricity by use of natural steam, more than enough energy to meet the electric needs for a city the size of San Francisco, he said.

Need High Temperature

Such geothermal water and steam occurs at temperatures of more than 400 degrees Fahrenheit.

Moderate and low-temperature water can be used instead of oil and natural gas for direct heat applications in industrial processing and in space heating.

Klamath Falls, Ore., Boise and Reno use geothermal water for direct heat applications.

In Milford Area

Utah uniquely has several potentially good sources of geothermal energy. And it will soon be used to generate electricity and provide heat for a variety of buildings, offices and homes, says Mr. Stowe.

Two 50-megawatt generating stations are to begin power production by 1984 in the Roosevelt Hot Springs area near Milford, site of extensive geothermal exploration.

Other southern Utah sites also are being studied for geothermal systems.

There are many hot springs through central and western Utah. These lower temperature geothermal systems could be used for heating offices, greenhouses, warehouses and homes.

The town of Monroe, Sevier County, will soon be heating a school and a number of other public and private buildings using 160-degree Fahrenheit geothermal water.

Prison Studies Plan

The Utah State Prison is studying use of geothermal water for heating the minimum security part of the prison.

Utah Roses, a major Sandy-based greenhouse, is looking to replace its conventional heating system with a geothermal system.

In the meantime, the UGMS has been exploring for low-temperature resources under funding from the U.S. Department of Energy.

In two years, it has drilled 20 test holes along the Wasatch Front from southern Salt Lake County to the Utah-Idaho border. The studies will continue into 1980.

Utah is fortunate in that its low-temperature geothermal resources are near population centers, says Mr. Stowe. While geothermal energy can't be put into automobile gasoline tanks, its increased use could relieve emphasis on fossil fuels — including oil — for electricity and heating.

Geothermal power really takes off

By Robert C. Cowen

Geothermal power – electricity made from subterranean heat – is becoming more than a gleam in an energy planner's eye.

The world's installed geothermal electric generating capacity still is only about 1,400 or 1,500 megawatts, equivalent to a single large central power station. But it is growing at a 16 percent annual rate. That's more than double the 7 percent rate that prevailed up to 1975.

"Something dramatic has happened over the past few years, both in the United States and in the rest of the world," says L. J. P. Muffler of the US Geological Survey. It encourages him to have confidence in the projection made by his group that geothermal power can meet something like 10 to 15 percent of US energy needs within two or three decades.

The energy reserve on which geothermal power plants can draw is immense. In a recently published study, Muffler's team estimates there are 32 million quads (quadrillion Btus) of heat energy in the upper 10 kilometers of Earth's crust under the United States. Perhaps as much as 6,400 quads could be put to practical use. That's an impressive resource, compared with the 80 quads of energy from all sources now consumed annually in the US. It also is equivalent to 1,200 billion barrels of oil.

Muffler's team considered two types of geothermal energy sources. One – called a hydrothermal convection system – powers natural geysers. This is the kind of resource already being exploited, for example, by the 660 megawatts' worth of plant at "The Geysers" in California. The USGS study estimates recoverable reserves of this kind of energy at 2,300 quads. That's 20 percent less than a 1975 estimate, due to better data and estimating techniques.

The other kind of geothermal resource (not yet exploited) is called "geopressured." This is hot water, rich in natural gas, held under pressure in deep formations. The Gulf Coast region has abundant geopressured resources. Exploiting them means developing techniques to drill to depths of several kilometers. Expressing confidence that this can be done, Muffler says this resource represents anywhere from 400 to 4,200 quads of recoverable energy in the form of hot water and methane (natural gas).

These two types of geothermal energy rely on naturally provided water. If engineers could develop practical ways to extract energy from hot dry rock by injecting water or other fluids, this could increase geothermal resources. A research team at the Los Alamos Scientific Laboratory estimates that exploitable HDR (hot dry rock) resources could equal US coal reserves in energy value.

Muffler says that HDR power is still too speculative to be included in his geothermal projections. Even without it, the estimated resources amply justify his expectation that geothermal power will become "a significant, although not a dominant, energy source." The possibility of developing HDR power only strengthens that expectation.

A Wednesday column

Roundup

Geothermal expert steamed

By George Ferguson
Associate business editor

During his national energy speech in early April, President Jimmy Carter overlooked geothermal as a source, to the amazement of Carlton Stowe, minerals specialist with Utah Geological and Mineral Survey.

"We estimate that about 2,400 quads (quadtrillion BTU's) of energy exist in geothermal systems throughout the United States," said Stowe. "U.S. consumption for 1979 will be about 80 quads."

Of course, not all of it can be harnessed for one reason or another. But Stowe said there is a potential of 95,000 to 150,000 megawatts of electricity to be produced by geothermal water. He added that 230 to 350 quads of energy might be available for direct heat application.

Stowe thinks the Utah potential is particularly favorable because geothermal systems are located close to population centers. He predicts geothermal energy will soon generate electricity and provide heat for a wide variety of Utah buildings.

"Roosevelt Hot Springs near Milford has been the site of extensive geothermal exploration," Stowe points out. "Two 50 megawatt electrical generation stations are scheduled for production by 1984."

Stowe said that water temperatures are greater than 240 degrees centigrade (465 degrees fahrenheit) in the Roosevelt Hot Springs area.

"Drill rigs (virtually the same as oil and gas drilling rigs) encounter tremendous pressure when they hit a pocket in this area. Steam shoots out with a tremendous roar," said Stowe.

"In order for a power plant to maintain the velocity needed to turn turbine engines, it should be ideally located within a mile of the geothermal source."

Stowe said the Roosevelt Hot Springs region could ultimately produce 500,000 kilowatts or more of electrical power.

Phillips Petroleum and Getty Oil

Carlton Stowe

have done much geothermal exploration in the region.

Plans for the first power plant in the area were announced early in 1978 by Rogers International of San Francisco.

Mountain States Resources Corp. of Salt Lake City acquired 1,945 acres near Roosevelt Hot Springs, adding to its 12,000 acres in Sevier County.

There is a big joint venture under way by O'Brien Resources, Amax Exploration Co., Thermal Power Co., and VTN Corp., aimed at establishing a 55 megawatt geothermal power plant by 1982. It is supported by a $12 million loan from the Department of Energy.

"Other sites in southern Utah are being examined for geothermal systems capable of producing electricity," said Stowe.

"Numerous hot springs throughout much of central and western Utah indicate wide spread presence of low temperature geothermal systems capable of a variety of space heat applications for offices, greenhouses, warehouses and homes."

Stowe said the town of Monroe soon plans to heat a school and other public and private buildings using geothermal water that is 160 degrees fahrenheit. He added that Utah State Prison officials are examining the possibility of heating the minimum security portion of the prison with geothermally heated water.

Utah Roses, a major greenhouse in Sandy, is seeking to replace a fossil fuel heating system with a geothermal space heating system.

"Geothermal energy is being used in many areas of the nation where water and steam with temperatures above 400 degrees fahrenheit are replacing fuel oil to generate electricity," he pointed out.

"At the Geysers area of California, 608 megawatts of electricity are produced from natural steam. This is more than enough to meet the electricity needs for a city the size of San Francisco."

Stowe said cities like Klamath Falls, Ore., Boise, Ida., and Reno, Nev., are using low temperature geothermal water for direct heat application such as industrial processing and space heating.

"During the past two years, a number of geological and geophysical investigations of known, but unexplored low temperature resources have been in progress," said Stowe.

"More than 20 geothermal test holes have been drilled along the Wasatch Front from southern Salt Lake County to the Utah-Idaho border. Investigations by UGMA geologists will continue into 1980 to provide more information on the nature of low temperature geothermal resources."

Stowe predicts geothermal energy will displace large quantities of fossil fuel in the generation of electricity and for heating offices and homes in Utah.

Mexican gas pipeline

Ogden lab purchased