

RENO INDUSTRIAL PARK GEOTHERMAL DISTRICT HEATING SYSTEM

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INTRODUCTION

Ten miles south of Reno, on U.S. 395 near the junction of the road to historic Virginia City, is Steamboat Hot Springs, a popular stop for travelers since the mid-1800s. Legend has it that Mark Twain named the geothermal area because it looked and sounded like a chugging Mississippi River paddle-wheeler. It is said when he first saw the steam rising from the ground he exclaimed, "Behold! A Steamboat in the desert." Over the years, the area has been used for its relaxing and curative qualities by Indians, settlers, and geothermal experts (Lund, 1978). Since the mid-1980s five geothermal power plants have been built at Steamboat Springs and in December 1996 it was announced that the proposed largest geothermal district heating system in the U.S. would supply an industrial park in the area.

The active geothermal area is located within the north-south trending graben like trough between the Carson and Virginia Ranges at the southern end of Truckee Meadows (Figure 1). Hot springs and other geothermal features occur over an area of about one square mile. The mid-basin location is controlled by faulting more or less parallel to the major mountain-front faults. It is believed that the heat source for the system is a cooling magmatic body at depth (Bateman, 1975).

The Steamboat geothermal area consists of a deep, high-temperature (215°C to 240 °C) geothermal system, a shallower, moderate-temperature (160°C to 18 °C) system, and a number of shallow low-temperature (30°C to 80 °C) subsystems (Garside, 1994). The higher temperature systems are used for electric-power generation. It is proposed that the exit fluids from the electric power plants be used for the geothermal district heating system. Geothermal electric power plants developed at Steamboat are summarized in Table 1

Table 1. Steamboat Geothermal Electric Power Plants,
Source: GPM, 1996.

Plant Name (Year Online)	Type	Owner	Rated Capacity (MW)
Steamboat Geo I(1986)	B	Far West	6.8
Yankee/Caithness (1988)	SF	Caithness/ Sequa	12
Steamboat Geo IA (1989)	B	Far West	1.2
Steamboat 2 (1992)	B	Steamboat Dev.	12
Steamboat 3 (1993)	B	Steamboat Dev.	12

GEOTHERMAL DISTRICT HEATING SYSTEM

"Reno Energy is proposing a massive geothermal district heating system that could supply up to 30 million square feet (equivalent of 15,000 homes) of commercial and residential space. The energy cost would be about half of what potential customers would pay for natural gas." This news item appeared in the Reno Gazette Journal, December 13, 1996 (Johnson, 1996). Reno is a big city with a large geothermal potential. It is only one of 271 cities in western states with low-to-moderate-temperature geothermal resources in their backyard (Lienau, 1996).

Reno Energy and Stone & Webster Engineering Corp. have worked together to develop the project and have signed agreements for the engineering and construction of the heating district. The estimated value of the project is currently \$32 million (Burch, 1996). The University of Nevada, Mechanical Engineering Department has prepared an economic engineering analysis (Kanoglu, 1996) of the project which determined that the geothermal district heating system can deliver heat energy at 35 to 55 percent cheaper than natural gas or heating oil. Other independent research has confirmed that the clean, renewable resource from the Steamboat Hills Geothermal Field is plentiful and dependable enough to heat more than 30 million square feet of space. The project will be funded entirely by private funds; however, indirectly DOE has already assisted with the project through the GHC technical assistance program and the Geothermal Direct Use Engineering and Design Guidebook (Lienau, 1991). The Nevada Public Service Commission has contacted the GHC about regulatory considerations for the project. Developers hope to serve the first customers by the spring of 1998.

Wells within the Steamboat Hills geothermal field extract fluids from the fault zones 185 to 610 m below the surface. This water averages about 157°C and is used to run the turbines at the Steamboat Power Plants. The brine left over from the electrical generation process is currently injected back into the geothermal zone it originated from. The exit fluid temperature from the power plants averages 99°C in the summer and 85°C in the winter at a flow rate of 1,135 L/s. In addition, it is planned that four new wells will supply about 500 L/s of 160°C fluid to a high temperature heat exchanger, necessary for absorption cooling. The estimated capacity from the geothermal source is 352 MWt and the peak heat demand for the industrial park is 264 MWt; therefore, there is a 33% reserve (Kanoglu, 1996). The geothermal brine is returned to the production zone as required by state law. The freshwater will be heated to 116°C and circulated through a "closed loop" underground pipeline, supplying clean, economic and renewable heat energy to customers.

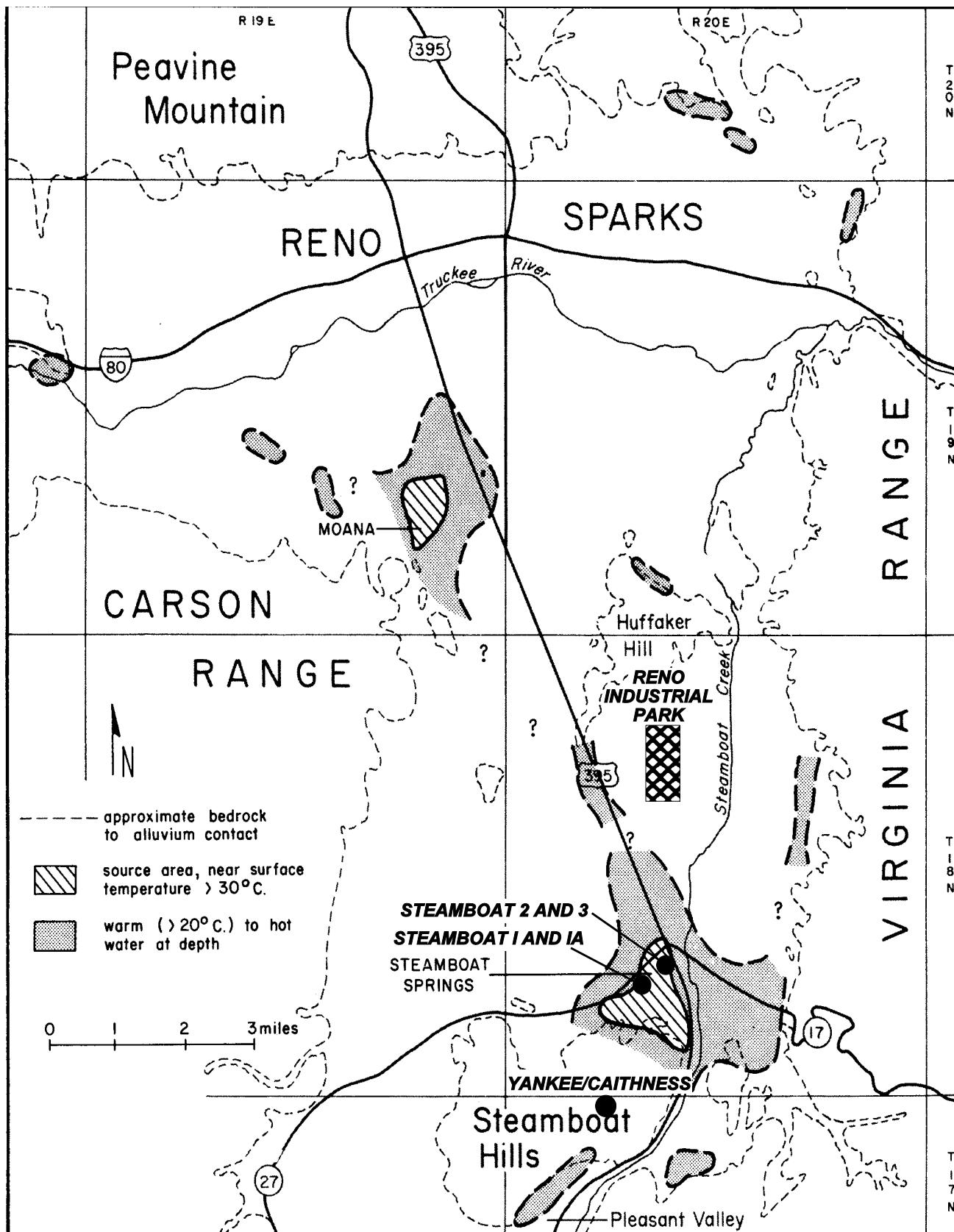


Figure 1. Areas of known thermal groundwater occurrence in the Truckee Meadows.

A large industrial park is being developed on a 1200 acre area in close proximity to the geothermal plants (Figure 1). The 300 acre 1st phase of the park is already sold out, and the entire park is expected to be developed within the next 7 years. The Park will house mostly commercial buildings with some industrial facilities, a 200-bed hospital and a 525-room hotel. It is expected that buildings with 30,000,000 square feet (264 MW_t) of floor space will be connected to the geothermal grid for heating (100%) and air-conditioning (45%). Also, Galena High School located nearby and the UNR Redfield Campus which will be built in the area as well as a planned Casino across the street are likely to be major consumers of geothermal heat (Kanoglu, 1996).

REFERENCES

- Johnson, A., 1996. Steam plan would heat south Reno. Reno Gazette Journal. 1996 December 13; Sec. D:1.
- Bateman, R.L. and R.B. Scheibach, 1975. "Evaluation of Geothermal Activity in the Truckee Meadows, Washoe County, Nevada." Nevada Bureau of Mines and Geology Report 25, 38 p.
- Burch, R., 1996. "Reno Energy, University of Nevada, Reno, To Announce Plans for World's Largest Geothermal Heating District." URL: <http://www.energy.rochester.edu/us/nv/reno/4dec96.htm>
- Garside, L.J., 1994. "Nevada Low-Temperature Geothermal Resource Assessment: 1994." Nevada Bureau of Mines and Geology Report, 101 p.
- GPM, 1996. "Geothermal Progress Monitor Report No. 18," USDOE, Office of Geothermal Technologies, Washington, DC.
- Kanoglu, M. Y. Cerci, Y.A. Cengel, R.H. Turner, and S. Colley, 1996. "Economics of Geothermal Heating/Cooling of Reno Industrial Park." Geothermal Resources Council Transactions, Vol. 20, 87-94.
- Lienau, P., H. P. Ross and P.M. Wright, 1996. "Low-Temperature Resource Assessment". Geothermal Resources Council Transactions, Vol. 19, 63-68.
- Lienau, P. and B. Lunis, editors, 1991. Geothermal Direct Use Engineering and Design Guidebook, 2nd Edition, Geo-Heat Center, Oregon Institute of Technology, Klamath Falls, OR.]
- Lund, J., 1978. "Steamboat Springs, Nevada". Geo-Heat Center Quarterly Bulletin, Vol. 3, No. 4, p 1-4.