Site Description

San Emidio Desert

(updated 2010)

Geologic setting: The San Emidio Desert is an east-tilted half graben, with major fault displacement near the east side of the valley. Wells for the power plant and dehydration facility produce from Miocene volcaniclastic rocks, which overlie Mesozoic metasiltstone and quartzite. The productive area is at the intersection of NNW- and NNE-striking faults ~1.5 km west of the range-front fault (Matlick, 1995).

H.F. Bonham described a ~4.4-km x 30m alteration zone (Secs. 9 and 16, T29N, R23E), presumably the surface expression of a fault, with mercury and sulfur deposits (Bonham, 1969, p. 95-96). Cinnabar, sulfur, gypsum, siliceous sinter, opal, chalcedony, quartz, kaolinite and other alteration minerals occur in the zone, within Pleistocene-era sands and gravels (Secs. 9 and 16, T29N, R23E). These altered deposits are covered by younger, unaltered alluvial and lacustrine deposits (Bonham, 1969). The alteration and mineralization represent the deposits of hot springs which were probably more active in the past. The geothermal resource was concealed until sulfur drilling operations uncovered a thermal anomaly.

Geothermal features: (Map)

Geothermal potential in the San Emidio Desert was little known until the late 1960's, when hot water was encountered in shallow sulfur exploration holes. These holes were drilled in alluvial material along the east side of the San Emidio Desert, ~1 km west of the Lake Range. The drill holes encountered 53°C water at one meter depth, but no springs were identified (Garside and Schilling, 1979). A spring is present, however, west of an altered zone in S½ SE¼ SW¼ Sec. 9, T29N, R23E (Mariner and others, 1976; Dennis Trexler, written commun., 2003). The spring was used by Empire Farms in the 1970's and photographed from the air by Tom Flynn in 1979; however, it is not shown on topographic maps of the area or described in any geothermal or water resource reports.

In 1955, a drill hole encountered boiling water at 29.5 m near the Sec. 9 spring (figure; T.A. Alberg, written commun., 1975). Chevron Oil Co. drilled 1,223-m and 1636-m geothermal test wells west of this area (Sec. 8, 9, T29N, R23E) in 1975 and 1978 (Garside and Schilling, 1979, Appendix 2). Temperatures up to 127ºC are reported from these wells (Bloomquist, 2004). Data on gradient wells are available in Sass and others (1999) and Matlick (1995). Peterson and Dansereau (1975) have reported principal facts for gravity stations at San Emidio, and Mackelprang and others (1980) have described the geology and geophysics. A map of the thermal anomaly is available in GeothermEx (2004).

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Both a vegetable dehydration plant (Lund, 1995) and a binary power plant are operational at the Empire (Farms) geothermal area. The binary power plant produces 4.6 MW of electricity from a 155°C resource; the plant came on-line in 1987. The Empire Energy binary plant shares the geothermal resource with the onion and garlic dehydration plant to the north. The dehydration plant produces about 27 million pounds (about 12 million kg) of dried onions and garlic per year. Wells at the dehydration plant produce fluids of 130-152°C (Bloomquist, 2004; Trexler and others, 1995).

Leasing information: U.S. Geothermal received a $3.8m DOE grant to explore San Emidio for large-diameter fractures using seismic surveys, PSInSAR, and kinematic structural modeling. In August 2010 USG received a Special Use Permit to construct their 8.6 MW (net) Phase 1 plant that will eventually replace the four aging 1.2 MW converters currently generating electricity.

The U.S. Department of Energy has provided funds ($1.6 million over 4 years) to help construct a small-scale geothermal power plant (1 MW net) adjacent to the dehydration facility (www.eren.doe.gov/geothermal).

Bibliography: