

GEOTHERMAL PIPELINE

Progress and Development Update
from the Geothermal Progress Monitor

OREGON

BPA, Calpine in 49.9-MW Geothermal Power Deal

Bonneville Power Administration recently signed an agreement to buy 49.9 MW of electric power from Calpine Corporation. The power will be produced at the Fourmile Hill Geothermal Development Project at Medicine Lake (Glass Mountain) in northern California. There has been strong opposition by environmental groups, summer home owners and Indian tribes, with a recent appeal to the agreement made by the Pit River Tribe. Exploratory drilling has already been approved and the plant is expected to be in operation in late 2004. Exploratory drilling will probably begin next spring. Calpine has received a \$20.8 million award from the California Energy Commission under its new renewable account to assist the project. BPA will pay about \$57 a MW-hr for 20 years. (Source: Reuters, Dec. 1, 2000).

CHINA

Beijing Will Explore New Energy Resources

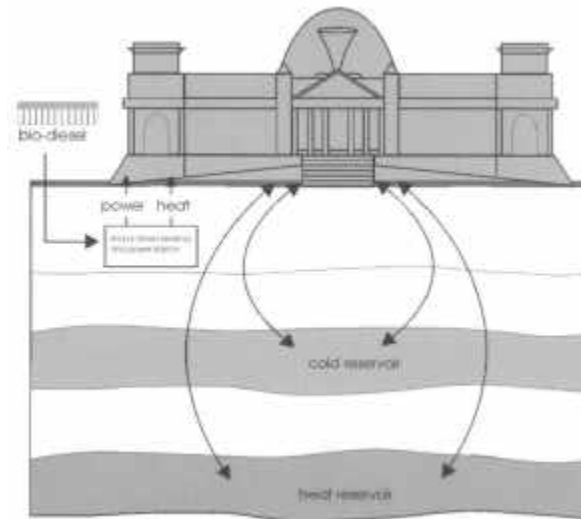
Beijing is exploring the use of new energy sources to improve its energy efficiency and to reduce pollution of coal, gas and oil in this major metropolis. This will include geothermal power, solar energy, bio-energy and wind power. This will also benefit their goal to win the bid for the 2008 Olympic games. Beijing has about 150 geothermal wells, capable of producing 8.8 million cubic meters (2.3 billion gal) of hot water annually, of which about 400,000 cubic meters (106 million gal) is being used for space heating. If the city explores for additional geothermal resources, the new energy will heat an additional 20 to 30 million square meters (24 to 36 million square yards) of floor space, equivalent to the consumption of 3 million tonnes (3.3 million tons) of coal annually. (Source: Xinhua News Agency, Dec. 1, 2000).

GERMANY

Energy Supply of the Reichstag Building in Berlin

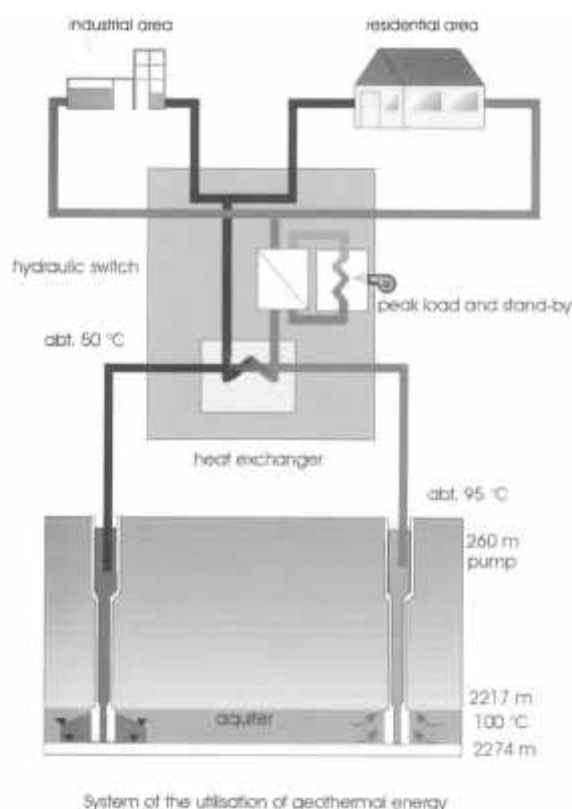
The reconstruction of the Reichstag building (destroyed in 1933), as the seat of the German Parliament, was completed in 1999. This building has an innovative heat generation and cold storage system developed and planned by GTN - Geothermie Neubrandenburg, Ltd of Germany. A bio-diesel fired 1,600 kW motor-driven heating and power station forms the heart of the system and provides the co-generation of power and heat. In summer, excessive heat of the motor-driven heating and power station is fed at a temperature of 70°C (158°F) into a subsoil heat reservoir located 300 m (1,000 ft) beneath the Reichstag building. In periods of peak demand in winter this heat can be directly recovered for the supply of special low-temperature heating systems. A second reservoir, about 50-m (165-ft) deep, is used for cold storage. Groundwater cooled down to 5°C (41°F) by ambient cold in

winter is stored here and is supplied in summer, without any additional driving energy, to the cooling system of the building. (source: Engineer and Geologist, 1999).



Neustadt-Glewe Geothermal Heating Station

Since 1995, the natural heat potential of the subsoil has been utilized by the Erdwärme Neustadt-Glewe Ltd. for the supply of heat to more than 1,100 households and



numerous industrial consumers at Neustadt-Glewe located in western Germany near Mannheim. The geothermal loops of the station was planned by GTN - Geothermie Neubrandenburg Ltd. By utilizing geothermal heat, which is used exclusively in direct heat exchange, the emission of 6,500 tonnes (7,200 tons) of CO₂ is avoided from a conventional gas-fired heating station of the same capacity. The thermal water loops production depth is 2,250 m (7,400 ft) and provides a flow rate of 125 m³/h (33,000 gal/h) from two wells. The station has an installed capacity of 10.7 MWt of which 6.5 MWt is geothermal and provides 23,700 MWh annually of which 22,200 MWh is provided by geothermal energy. The reservoir temperature is 100°C (212°F) and the temperature at the heat exchangers is 95°C (203°F). (Source: *Engineer and Geologist*, date unknown)