Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06202, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06202
EGU General Assembly 2008

Geothermal Potential Analysis of the Upper Rhine Valley

A.G. Grunert, P. Viejo

European Institute for Energy Research, Karlsruhe, Germany

The total installed capacity of worldwide geothermal power plants has multiplied since 1975 by nearly 7.5 up to 9.732 MW in 2007 (Bertani 2007). Geothermal use for power production started experimentally in 1904 in Italy. The first commercial plant was built in 1913 at Larderello in Italy. Thereupon followed plants in Mexico, New Zealand and the United States. Today 24 countries are producing about 60.000 GWh/a (Lund 2007).

Geothermal energy is practically inexhaustible. Because of its stability within a day or even a year, it can be used as base load. A combination of electricity- and heat-production can lead to a more efficient and economical system considering the high exploration risks and initial costs. To avoid high drilling depths and therefore high costs, geothermal power plants are built in active geological zones with higher geothermal gradients ($> 4^{\circ}$C/100 m). In Germany there are three regions with higher geothermal gradients: the Southern German molasse basin, the Northern German lowlands and the Upper Rhine Valley in the South West of Germany. This valley belongs to the central part of the European Cenozoic Rift System, which developed in the Oligocene and extends from Basel to Frankfurt (300 x 35 km). The Hercynian basement lies in depths between 1200 m and 3500 m and is superimposed by secondary sediments deposed from lower Trias to Jura times as well as sediments from the Tertiary and Quaternary.

For deep hydrothermal usage, the three aquifer systems Buntsandstein (lower Triassic: Sandstone intercalated with clay), Muschelkalk (mid Triassic: composed of clayey and sandy limestones and dolomites) and Hauptrogenstein (Bajocian and Bathonian, Jura:

made of oolithic limestones, clayey at the base) are of particular interest.

Using Geographic Information System (GIS) and its data integration, analysis and visualisation capabilities, the exploratory phase for an appropriate location of a geothermal power plant can be supported. Therefore, geothermal potential maps were created from aquifers with a medium temperature range (90˚C $<$ T $<$ 150˚C) of the German and the French part of the Upper Rhine Valley, considering depth levels, heat and water flow, groundwater temperatures, reservoirs and infrastructures. Furthermore, it is also planned to consider heat demand and heat consumption data. The geothermal potential can be subdivided into theoretical (total heat), technical and economical potential, decreasing with the specified order. Plenty of theoretical potential (total heat resources) analyses were carried out for Germany (e.g. Jung 2002), but there is a lack of technical and economical analyses.

On the poster we present GIS-maps of the local temperature, thickness and the top of the three aquifers in the Upper Rhine Valley. The evaluation of the first results indicates that the usage of geothermal energy seems to be promising at some northern and southern parts of the Upper Rhine Valley.