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Scientific and technical monitoring of the Soultz geothermal power plant (Rhine Graben, France)

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Over two decades of research and development of a deep geothermal reservoir at Soultz (France), a pilot geothermal power plant with 1.5MWel netto has been built by a French-German industrial consortium. The Soultz site which is located in the Upper Rhine Graben, some 50 km NE of Strasbourg, was selected based on the huge quantities of petroleum data available from the old oil industry. The initial geothermal target was a hidden crystalline basement reputed impermeable.

The drilling of various exploration and geothermal boreholes at great depth, has yielded fundamental insights into the geology, nature of fracturing, fluid geochemistry, temperature and hydraulic properties of deep crystalline rock mass. Two exploration wells and three geothermal wells representing about 20 km length of wells were drilled. After the drilling operations, all the wells were hydraulically and chemically stimulated. Several circulation tests were done and showed encouraging hydraulic results. Geochemical analyses and tracer tests revealed that a significant natural hydraulic reservoir exists in the rock mass. The reservoir almost certainly resides in a connected network of permeable fractures which were seen at the wellbore on core and borehole images, and could be imaged remotely from the well from high-resolution images of the pattern of induced microseismicity. Good hydraulic communication was observed between some wells, most likely due to the presence of a major Hydrothermally Altered and Fractures Zone (HAFZ) that cuts both wells (Sausse et al. 2010). Exploration and hydraulic tests have shown that it does not correspond to the original, classical Hot Dry Rock (HDR) concept (Genter et al. 2010).

The power plant is not yet in its commercial exploitation phase due the on-going revision of the French feed-in tariff of the geothermal kWh. However, as the geothermal production has been running for a while, a scientific and technical monitoring of the power plant is on-going. Many data about the deep reservoir (tracer, fluid geochemistry, induced micro-seismicity, temperature, pressure, flow rate) are collected during circulation (Cuenot et al. 2010). Thus a tracer test with an organic tracer is running as well as a physico-chemical monitoring of the produced fluid. Induced micro-seismicity activity during hydraulic circulation is rather low and the maximum recorded magnitude was 2.3, for an event which occurred deeper than 5 km depth. Due to the presence of a native brine, corrosion studies of the main surface equipments (casing, heat exchanger, pipes) or scaling within the filtering system are also regularly investigated through a corrosion tool available on-site combined with lab studies. Different kind of steel coupons have been investigated at reinjection conditions A corrosion rate between 0,1 and 0,2 mm per year has been calculated in the cooling part of the geothermal surface loop (Baticci et al. 2010).

The scientific and technical data collected on the Soultz power plant will represent an unique opportunity to investigate in real on-site conditions an operating Enhanced Geothermal System.

References

Baticci, F., Genter, A., Huttenloch, P. & Zorn, R. (2010): Corrosion and scaling detection in the Soultz EGS power plant, Upper Rhine Graben, France. – World Geothermal Congress, WGC2010, Bali, Indonesia, April 2010.

Cuenot, N., Dorbath, L., Frogneux, M. & Langet N. (2010): Microseismic activity induced under circulation conditions at the EGS project of Soultz-sous-Forêts (France). – World Geothermal Congress, WGC2010, Bali, Indonesia, April 2010.

Genter, A., Evans, K.F., Cuenot, N., Fritsch, D. & Sanjuan, B. (2010): Contribution of the exploration of deep crystalline fractured reservoir of Soultz to the knowledge of Enhanced Geothermal Systems (EGS). – C.R. Geoscience, 342 : 502-516 ;

Sausse, J., Dezayes, Ch., Dorbath, L., Genter, A. & Place J. (2010): 3D fracture zone network at Soultz based on geological data, image logs, microseismic events and VSP results. – C.R. Geoscience, 342: 531-545;