

Microseismic event analysis in conjunction with stimulation treatments at the geothermal research well GtGrSk4/05 in Groß Schönebeck/Germany

Kwiatek, G., Bohnhoff, M., Dresen, G., Schulze, A., Schulte, T., Zimmermann, G., Huenges, E.

GeoForschungsZentrum Potsdam, Email: bohnhoff@gfz-potsdam.de

The technical feasibility of geothermal power production will be demonstrated in the geothermal research wells Groß Schönebeck using a borehole doublet. This task includes safeguarding the thermal fluid cycle and the optimisation of energy conversion technology at the surface. The existing well Groß Schönebeck (E GrSk 3/90) was tested to investigate scenarios of enhancing productivity of thermal fluid recovery from the underground. The forthcoming project was to complete the doublet with a second well (Gt GrSk 4/05) with a total depth of 4400 m. For the development of a maximum effective pay zone the new well is inclined in the reservoir section with 47° and was drilled in the direction of the minimum horizontal stress ($\sigma_h=288^\circ$) for optimum hydraulic fracture alignment in relation to the stimulated pre-existing well E GrSk 3/90. Hence the orientation of the fractures will be 18° N in the direction of the maximum horizontal stress. The fracture treatment design comprises three fracture treatments, two in the sandstone section (Upper Rotliegend, Dethlingen Formation) and one in the volcanic section (Lower Rotliegend). In the low permeable volcanic rocks a waterfrac treatment in conjunction with a low proppant concentration to achieve a long-term productivity and a fracture half length of up to 300 m was performed. To monitor injection-induced seismicity during the main injection, a downhole seismic sensor (natural frequency: 15Hz) was deployed in GrSk 3/90 at 3800m depth at ~500m distance to the injection point. In addition four geophones (4.5Hz) in 60m deep boreholes and two surface seismometers (1Hz) were deployed. Results of the seismic monitoring campaign are discussed and related to other observations of induced seismicity related to massive fluid injection.