

Development of a Design Tool for Hot-Dry-Rock Fracture Systems



P. Siebert¹, N. Weber², R. Schütt³, M. Feinendegen¹, K. Willbrand³, M. Ziegler¹, T.P. Fries²,
C. Clauser³

¹*Geotechnical Engineering, RWTH Aachen University, Germany,*

²*Institute for Computational Analysis of Technical Systems, RWTH Aachen University, Germany,*

³*Institute of Applied Geophysics and Geothermal Energy, RWTH Aachen University, Germany*



The Hot-Dry-Rock (HDR) technology has great potential for large-scale conversion of geothermal energy into electric energy. Pressurized water is used to fracture hot rock at depth of about 3-5 km in order to create an engineered underground heat exchanger. For producing geothermal heat, cold water is injected down to the fractured hot rock and heated up while passing through. Brought back to the surface it is used to drive a steam power plant.

Yet the engineering of this heat exchanger needs to be developed to the point where the outcome can be predicted within specified uncertainty, and the technology remains to be proven viable on a commercial scale. Technological and financial risk evaluation is needed. In the current project we aim to (1) improve the understanding of the process of fracture formation and (2) develop a numerical lay-out tool for the design of the underground heat exchanger which is verified against results from large-scale laboratory experiments. On a long-term perspective, the software tool will help to quantify and reduce the risks of insufficient flow rates and induced seismicity and help to optimize production performance.