EGU22-12492, updated on 16 Aug 2022
https://doi.org/10.5194/egusphere-egu22-12492
EGU General Assembly 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Geothermal exploitation in the inverted part of the Lower Saxony Basin: A case study from the Minden area

Olga Knaub[1,2], **Alexander Jüstel**[1,2], Gregor Bussmann[3], Florian Wellmann[4], and Peter Kukla[1,2]

[1]Geological Institute, RWTH Aachen University, Wüllnerstraße 2, 52062 Aachen, Germany
[2]Fraunhofer IEG, Fraunhofer Research Institution for Energy Infrastructures and Geothermal Systems, Kockerellstraße 17, 52062 Aachen, Germany
[3]Fraunhofer IEG, Fraunhofer Research Institution for Energy Infrastructures and Geothermal Systems, Am Hochschulcampus 1, 44801 Bochum, Germany
[4]Computational Geoscience and Reservoir Engineering, RWTH Aachen University, Wüllnerstraße 2, 52062 Aachen, Germany

Issues of sustainability and climate change are among the driving forces of current research aiming to remedy the grave consequences of greenhouse gas emissions. The consequent system change into the usage of regenerative energy sources through the replacing of fossil fuels represents the most promising solution. This structural change poses large challenges not only for metropolitan areas, but also for smaller towns, which intend to increasingly utilize renewable energies. One such example is the city of Minden in the northernmost part of the state of North Rhine-Westphalia, which serves as case study for this project. The city is geologically situated in the inverted part of the Lower Saxony Basin. This represents a sub-basin in the western part of the North German Basin, which is one of three economically viable regions for geothermal energy production in Germany. The investigation of the feasibility of generating electricity and heat through the exploitation of the deep geothermal reservoirs was driven based on the requirements of a company situated in Minden, which exclusively uses fossil fuels for their industrial processes. In order to generate steam, the production requires high temperatures from the subsurface (> 140°C).

The evaluation of geothermal projects conducted in the North German Basin, regional studies and interpretation of 2D seismic data confirmed the existence of the so-called Wiehengebirge Syncline with outcropping Jurassic rocks in the mountain range to the south of Minden. The compilation of all available data and models highlighted Mesozoic layers of the middle Bunter sandstone (Volpriehausen-Solling formations, 4.0-4.5 km), the Keuper (Stuttgart formation, 3.0-3.3 km) and the Dogger (Bathonium-Callovium formations, 1.8-2.4 km) as potential target horizons within the syncline. Moderate to good hydraulic properties are anticipated for the siliciclastic targets. Furthermore, the hydraulic productiveness of a fault mapped in the immediate vicinity of the investigation site was determined through dynamic reservoir simulations.

Moreover, drilling data provided by the hydrocarbon industry from the gas fields to the north of the city (e.g. Uchte) were used to set up a thermo-hydraulic model in order to determine temperatures and flow rates. These should ultimately specify the most promising formations

within the afore mentioned Mesozoic units for further geothermal exploration and developments.

Summarizing, first results of this study have confirmed the deep geothermal energy potential of the western part of the North German Basin and the city area of Minden.