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Medium Deep High Temperature Heat Storage

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Heating of buildings requires more than 25 % of the total end energy consumption in Germany. Shallow geothermal systems for indirect use as well as shallow geothermal heat storage systems like aquifer thermal energy storage (ATES) or borehole thermal energy storage (BTES) typically provide low exergy heat. The temperature levels and ranges typically require a coupling with heat pumps.
By storing hot water from solar panels or thermal power stations with temperatures of up to 110 °C a medium deep high temperature heat storage (MDHTS) can be operated on relatively high temperature levels of more than 45 °C. Storage depths of 500 m to 1,500 m below surface avoid conflicts with groundwater use for drinking water or other purposes. Permeability is typically also decreasing with greater depth; especially in the crystalline basement therefore conduction becomes the dominant heat transport process. Solar-thermal charging of a MDHTS is a very beneficial option for supplying heat in urban and rural systems.
Feasibility and design criteria of different system configurations (depth, distance and number of BHE) are discussed. One system is designed to store and supply heat (300 kW) for an office building. The required boreholes are located in granodioritic bedrock. Resulting from this setup several challenges have to be addressed. The drilling and completion has to be planned carefully under consideration of the geological and tectonical situation at the specific site.