

Shallow geothermal energy systems: Current technical design and suggestions for its improvement

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Geothermal energy systems have base load capacities. Therefore shallow geothermal energy systems can become more and more important as a decentralized energy supply for heating and cooling of buildings. Sustainability and efficiency of the installed supply systems are desired results of their design procedure as well as reasonable investment costs. Therefore reliable technical design procedures play a significant role for the functionality of the systems.

We present a short overview about the current technical design procedures for borehole heat exchangers installations in Germany. Thereby we analyze different regulatory conditions of the German federal states. Differences in available information and related parameters of the subsurface are presented as well. Finally we pay attention to the underlying assumptions within the technical design framework and their impact on the design.

We discuss the specific heat extraction as the most important quantity, defining the length of the borehole heat exchanger. To realize a sustainable use of the shallow geothermal energy we propose a new, more informative quantity for an easier evaluation of the exploitability of geothermal resources. This quantity is called exploitable shallow geothermal energy and takes into account already installed geothermal plants in the neighborhood.

Other effects, which are influencing the functionality of the energy system, as for example groundwater flow or already installed systems in the neighborhood, are discussed.

Based on the outlined problems we propose a modified workflow for the technical design of shallow geothermal energy systems. This workflow should help on the one hand decision-makers as well as the consulting and designing engineers to realize reliable and efficient geothermal systems.