

EGU24-16554, updated on 15 May 2024

<https://doi.org/10.5194/egusphere-egu24-16554>

EGU General Assembly 2024

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Current research on Aquifer Thermal Energy Storage in Germany

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Around 30 % of Germany's final energy consumption can be attributed to heating and cooling in the building sector. Aquifer Thermal Energy Storage (ATES) allows sustainable and climate-friendly space heating and cooling and is therefore a promising technology that can contribute to decarbonizing this sector. However, further research on ATES is needed to promote the so far limited application of this technology in Germany and other countries. This work therefore gives an overview of current ATES research sites and projects in Germany collected in the project 'SpeicherCity'. Among other aspects, these projects address hydrogeochemical challenges, potential studies and the integration of ATES into existing energy systems. They include both low-temperature (LT) and high-temperature (HT) ATES systems. This review also provides details on reservoir characteristics and well designs of the individual sites as well as information on the research goals and methods. Based on the comprehensive German research activities on ATES compiled in this work, lessons learned from the research findings and experiences with ATES operation and permission are highlighted.