

What is high-temperature aquifer thermal energy storage?

High-temperature aquifer thermal energy storage (HT-ATES) is a cost-effective and suitable technology to store large amounts of energy. HT-ATES has been demonstrated to be an efficient and stable tool to buffer seasonal imbalances and significantly reduce greenhouse gas emissions.

What is a aquifer thermal energy storage (ATES)?

One of the most common UTES is aquifer thermal energy storage (ATES). ATES is a bidirectional systemthat consists of one or more wells that inject or extract thermal energy into aquifers (Schüppler et al. 2019).

Which aquifer thermal energy storage system has the largest storage capacity?

UTES sites can be located in underground pits,tanks,mines,caverns,and aquifers,where large amounts of sensible heat can be stored with high efficiency. Among these options,aquifer thermal energy storage (ATES) has the largest storage capacity. ATES is a proven technology with great storage potential.

Are aquifers a good source of energy for well insulated buildings?

Experiences from Rostock and the Netherlands indicate that storage temperatures of 40-60 °C in shallow urban aquifers bear a high potential for the supply of heating systems in well insulated buildings. The ATES proved not only to be technically robust but also facilitates establishment of an autarkic energy system.

What is Ates aquifer system?

ATES is a bidirectional systemthat consists of one or more wells that inject or extract thermal energy into aquifers (Schüppler et al. 2019). ATES stands out for its high storage capacity and for being useful in both small and large facilities (Pellegrini et al. 2019; Fleuchaus et al. 2018).

How does a hydraulic aquifer system affect energy recovery?

The system becomes more efficient in terms of energy recovery after longer time in operation. Both thermal and hydraulic loads have an important effect on the displacements within the aquifer. Uplift is concentrated near the central well at the surface.

Low-temperature (< 25 °C) aquifer thermal energy storage (LT-ATES) is already widely-deployed in central and northern Europe, and there is renewed interest in high-temperature (> 50 °C) aquifer thermal energy storage (HT-ATES). However, it is unclear if LT-ATES guidelines for well spacing, reservoir depth, and transmissivity will apply to HT ...

Aquifer thermal energy storage (ATES) as a complement to fluctuating renewable energy systems is a reliable technology to guarantee continuous energy supply for heating and air conditioning. We investigated a high-temperature (HT) mono-well system (c. 100°C), where the well screens are separated vertically within the aquifer, as an alternative to ...



High-temperature aquifer thermal energy storage HT-ATES Heat storage Reservoir engineering Levelized cost of heat Geothermal energy A B S T R A C T Aquifer thermal energy storage (ATES) is a time-shifting thermal energy storage technology where waste heat is stored in an aquifer for weeks or months until it may be used at the surface.

4 · 1.1 High Temperature Aquifer Thermal Energy Storage Though the concepts are similar, there are distinctions between the HT-ATES and the low-temperature aquifer thermal energy storage (LT-ATES). LT-ATES is used for house/building cooling and warming, using ...

High-temperature aquifer thermal energy storage (HT-ATES) may play a key role in the development of sustainable energies and thereby in the overall reduction of CO 2 emission. To this end, a thorough understanding of the thermal losses associated with HT-ATES is crucial.

The storage of heat in aquifers, also referred to as Aquifer Thermal Energy Storage (ATES), bears a high potential to bridge the seasonal gap between periods of highest ...

On the basis of underground depth, ATES is further divided into low-temperature aquifer thermal energy storage (<500 m) (LT-ATES) and high-temperature aquifer thermal energy storage (>=500 m) (HT-ATES) [3]. Although LT-ATES is of low cost according to available research, it has disadvantages such as low storage temperature, unbalanced cold and ...

High-temperature aquifer thermal energy storage system usually shows higher performance than other borehole thermal energy storage systems. Although there is a limitation in the widespread use of the HT-ATES system because of several technical problems such as clogging, corrosion, etc., it is getting more attention as these issues are gradually alleviated.

High-temperature aquifer thermal energy storage (HT-ATES) systems can help in balancing energy demand and supply for better use of infrastructures and resources. The aim of these systems is to ...

High temperature aquifer thermal energy storage (HT-ATES) can contribute to the integration of renewable energy sources in the energy system, the replacement of fossil fuel-based heat supply and ...

Evaluating thermal losses and storage capacity in high-temperature aquifer thermal energy storage (HT-ATES) systems with well operating limits: insights from a study-case in the Greater Geneva Basin, Switzerland ... Hydrochemical aspects of high-temperature aquifer storage in carbonaceous aquifers: evaluation of a field study. Geoth Energy, 7 ...

The concept of aquifer thermal energy storage (ATES) has evolved from theory to the point where system feasibility has been demonstrated technically and commercially, in particular for low ...



High-temperature aquifer thermal energy storage (HT-ATES) is an important technique for energy conservation. A controlling factor for the economic feasibility of HT-ATES is the recovery efficiency. Due to the effects of density-driven flow (free convection), HT-ATES systems applied in permeable aquifers typically have lower recovery efficiencies than ...

Geothermal heating technology based on high-temperature aquifer thermal energy storage (HT-ATES) is one of important development directions of geothermal multi-energy complementary and integrated energy system present article, thermal performance of HT-ATES based on a practical project is first proposed, and a long-term cycle of HT-ATES is constructed ...

Semantic Scholar extracted view of "Recovery efficiency in high-temperature aquifer thermal energy storage systems" by H. Sheldon et al. Skip to search form ... @article{Sheldon2021RecoveryEI, title={Recovery efficiency in high-temperature aquifer thermal energy storage systems}, author={Heather A. Sheldon and Andy H. Wilkins and Christopher ...

Aquifer thermal energy storage is an approach used to enhance the efficiency in comparison with other ground energy system. ATES installation actively store cooled and heated groundwater in the ground from respective heating and cooling mode cycles ... the storage wells for high temperature heat storage are preferably drilled to greater depths ...

More than 30% of Germany's final energy consumption currently results from thermal energy for heating and cooling in the building sector. One possibility to achieve significant greenhouse gas emission savings in space heating and cooling is the application of aquifer thermal energy storage (ATES) systems. Hence, this study maps the spatial technical potential ...

The range of simulated storage is in the 26th operational year from 64 % to 92 % shows that high temperature aquifer thermal energy storage (HT-ATES) operation is feasible in all scenarios. With a median of 89 % and a standard deviation of 5 %, the majority of the scenarios exhibit high i, with only two scenarios exhibiting is less than 78 %.

Thermal performance of medium-to-high-temperature aquifer thermal energy storage systems. Author links open overlay panel Liuhua Gao a b, Jun Zhao a, Qingsong ... The influence of the injection temperature on the recovery efficiency of high temperature aquifer thermal energy storage: comment on Jeon et al., 2015. Energy, 103 (2016), pp. 107-109 ...

Aquifer thermal energy storage (ATES) is a natural underground storage technology containing groundwater and high porosity rocks as storage media confined by impermeable layers. Thermal energy can be accessible by drilling wells into such aquifers. The drilling depth is reported up to 1000 m, but the median value is 200 m (Fleuchaus et al., 2021). ...

The number of high temperature aquifer thermal energy storage



(HT-ATES)systemsisstilllimited, although the storage of water

withhighertemperatures(e.g.>70°C)increasesboththeenergy storage capacity and overall energy efficiency (e.g. Kabus and Seibt 2000;Sanneretal.2005; Réveillère et al. 2013). A huge

Aquifer Thermal Energy Storage (ATES) systems are a proven technology for reducing fuel consumption for heating and cooling purposes. Thermal energy storages are available at ...

The feasibility of high-temperature aquifer thermal energy storage in Denmark: the Gassum Formation in the Stenlille structure June 2020 Bulletin of the Geological Society of Denmark 68:133-154

Aquifer Thermal Energy Storage (ATES) systems are a proven technology for reducing fuel consumption for heating and cooling ... (LT-ATES) operate between 10-40°C whereas high temperature ATES (HT-ATES) operate at temperatures above 50°C (Lee, 2013). Many LT-ATES for heating and cooling were successfully realized in North America, China and ...

According to stored temperature of water, the ATES can be divided into low- and intermediate-temperature aquifer thermal energy storage (the temperature is less than 50 °C and the depth of aquifer is below 500 m) and high-temperature aquifer thermal energy storage (the temperature is greater than 50 °C and the depth is usually above 1000 m) [4].

Recently, high temperature aquifer thermal energy storage (HT-ATES) has received more and more attentions due to higher storage temperature and larger storage capacities and however, low thermal ...

Heat storage efficiency, ground surface uplift and thermo-hydro-mechanical phenomena for high-temperature aquifer thermal energy storage Geotherm Energy, 10 (1) (2022), p. 23, 10.1186/s40517-022-00233-3

High-temperature aquifer thermal energy storage in Denmark · 135 The Stenlille structure and facility - geological background The Stenlille structure is a probably salt-induced

2) High-Temperature Thermal Energy Storage (HT-ATES) used for large scale heat storage with injection temperatures in the hot well between 40 and 90°C. The injection temperature of the "cold" well can be

Semantic Scholar extracted view of "Risk analysis of High-Temperature Aquifer Thermal Energy Storage (HT-ATES)" by P. Fleuchaus et al. Skip to search form Skip to main ... {Risk analysis of High-Temperature Aquifer Thermal Energy Storage (HT-ATES)}, author={Paul Fleuchaus and Simon Sch{"u}ppler and Martin Bloemendal and Luca Guglielmetti and ...

The efficiency of heat recovery in high-temperature (>60 °C) aquifer thermal energy storage (HT-ATES) systems is limited due to the buoyancy of the injected hot water. This study investigates the potential to improve the efficiency through compensation of the density difference by increased salinity of the injected hot water for a single injection-recovery well ...



Aquifer thermal energy storage systems in the sediments of the Upper Jurassic in the north-eastern part of the Bavarian Molasse Basin seem to be feasible in terms of the hydrogeological and hydrochemical setting. This study presents unique results from the first large-scale high-temperature heat storage test in these sediments and a hydrogeochemical model ...

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