Aquifer thermal energy storage theoretical and operational analysis

The time offset between supply and demand in the energy sector can be equalized with seasonal energy storage (at relatively warm or cold temperatures). For the latter, aquifer thermal energy storage (ATES) is considered a promising solution. However, with only a single low-temperature (LT) and another high-temperatures (HT) storage system currently in ...

Semantic Scholar extracted view of "Realistic simulation of an aquifer thermal energy storage: Effects of injection temperature, well placement and groundwater flow" by A. Yapparova et al. ... Aquifer thermal energy storage: theoretical and operational analysis. J. Dickinson N. Buik M. Matthews A. Snijders. Environmental Science, Engineering.

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 ...

The transfer of thermal energy is carried out by extracting groundwater from the aquifer and by reinjecting it at a modified temperature into a separate well nearby. In the present work, a brief review is presented on the concepts and applications of ATES systems.

Aquifer thermal energy storage (ATES) is an approach used to enhance the efficiency in comparison with other ground energy systems. ATES installations actively store cooled and ...

Aquifer thermal energy storage: theoretical and operational analysis. Nick Buik. ... Kari; Virtanen, Markku; Kosonen, Risto A method and analysis of aquifer thermal energy storage (ATES) system for district heating and cooling Published in: Sustainable Cities and Society DOI: 10.1016/j.scs.2019.101977 Published: 01/02/2020 Document Version ...

Aquifer thermal energy storage (ATES) systems provide a method of improving the performance of more commonly installed mono-direction groundwater heating and cooling ...

The objective of the present study is to analyse the economic and environmental performance of ATES for a new building complex of the municipal hospital in Karlsruhe, Germany. The studied ATES has a cooling capacity of 3.0 MW and a heating capacity of 1.8 MW. To meet the heating and cooling demand of the studied building, an overall pumping rate of 963 m3/h is ...

UTES can be further subdivided into open-loop or closed-loop systems. In open-loop systems, also referred to as Aquifer Thermal Energy Storage (ATES), sensible heat and cold is temporarily stored in the subsurface through injection and withdrawal of groundwater,, .

Aquifer thermal energy storage theoretical and operational analysis

Sensible energy storage in aquifers: 1. Theoretical study Saugy B. Speos-dorigny and associated projects on aquifer thermal energy storage: Annex III des Programms der Internationalen Energieagentur: Energy conservation through energy storage. Jülich; 1992. Kannberg LD. Underground Energy Storage Program: 1981 annual report. Volume II.

Peak time shaving and shifting by thermal energy storage are thus considered as a key to the transition of the heating and cooling sector from fossil-based to zero-carbon. To balance the temporal variations in the availability and demand, Aquifer Thermal Energy Storage (ATES) is characterized by high storage capacities and low storage costs and ...

To meet the global climate change mitigation targets, more attention has to be paid to the decarbonization of the heating and cooling sector. Aquifer Thermal Energy Storage (ATES) is considered to bridge the gap between periods of highest energy demand and highest energy supply. The objective of this study therefore is to review the global application status of ATES ...

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 thermal energy demand and ...

Aquifer thermal energy storage: theoretical and operational analysis. Géotechnique (2009) ... 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. It can reduce carbon emissions and HVAC costs.

Aquifer thermal energy storage (ATES) is the storage and recovery of thermal energy in subsurface aquifers. ATES can heat and cool buildings. ... Storage of thermal energy in aquifers was suggested in the 1970s which led to field experiments and feasibility studies in France, Switzerland, US and Japan. [8]

Aquifer thermal energy storage (ATES) is used for seasonal storage of large quantities of thermal energy. Due to the increasing demand for sustainable energy, the number of ATES systems has increased rapidly, which has raised questions on the effect of ATES systems on their surroundings as well as their thermal performance. Furthermore, the increasing ...

Aquifer Thermal Energy Storage (ATES) is considered to bridge the gap between periods of highest energy demand and highest energy supply. The objective of this study therefore is to review the global application status of ATES underpinned by operational statistics from existing projects.

This study proposes a novel aquifer thermal energy storage system in which several multilateral wells are side-tracked from the vertical well in the aquifer. Radial branches ...

Aquifer thermal energy storage theoretical and operational analysis

Conceptual model for an aquifer thermal energy storage system. 639 640 Spatial temperature distributions predicted by present solution and Li et al."s 651 (2010) solution at t = 30, 60, and 90 ...

The simulated effect of various geometrical and operational parameters on aquifer thermal behavior and final producing temperature, under regional groundwater flow conditions, were studied for a 10-year, continuous injection and withdrawal system.

Aquifer Thermal Energy Storage (ATES) is considered to bridge the gap between periods of highest energy demand and highest energy supply. The objective of this study ...

Aquifer thermal energy storage (ATES) systems provide a method of improving the performance of more commonly installed mono-direction groundwater heating and cooling systems. Rather than using the prevailing temperature of the abstracted groundwater, ATES systems are bidirectional, therefore allowing for the interseasonal storage of low- and higher-temperature ...

Inspired by the CO 2 geological utilization, the combination of CCUS and aquifer thermal energy storage technology is a reasonable idea to make full use of saline aquifers, decrease greenhouse gas emissions and reduce the cost of CO 2 storage. Aquifer thermal energy storage (ATES) is an effort in the aquifer storage and utilization [16]. It is ...

Key Points: Dimensionless analytical solutions of Aquifer Thermal Energy Storage (ATES) thermal efficiency F for various plume geometries, dispersion processes, and transient pumping. F ...

Aquifer thermal energy storage (ATES) systems provide a method of improving the performance of more commonly installed mono-direction groundwater heating and cooling systems.

Aquifer thermal energy storage (ATES) technology has become a hotspot and urgent topic, given the increasing severity of carbon dioxide emissions and resource depletion. ... Aquifer thermal energy storage: Theoretical and operational analysis. Geotechnique, 59 (3) (2009), pp. 249-260. Crossref View in Scopus Google Scholar [5] L. Kun sang. A ...

These systems are typically referred to as being "closed." For Aquifer Thermal Energy Storage [13], also referred to as open systems, ... Aquifer Thermal Energy Storage: Theoretical and Operational Analysis. 59, IcevirtuallibraryCom (2009), pp. 249-260, 10.1680/geot.2009.59.3.249. View in Scopus Google Scholar [10]

In general, groundwater temperatures remain relatively stable at temperatures typically 1-2 °C higher than local mean annual temperatures between depths of 10-20 m. Below these depths, groundwater temperatures gradually increase at a rate of geothermal gradient. As a result, in areas where a supply of groundwater is readily available from an aquifer, a reliable source of ...

Aquifer thermal energy storage theoretical and operational analysis

With the world"s need for energy rising, scientific energy use has emerged as a crucial component of future sustainable development [1, 2].The demand for heating and cooling in the built environment accounts for around 40% of the world"s total primary energy consumption [3, 4].Underground thermal energy storage (UTES) is a practical way to lower this energy ...

Aquifer thermal energy storage (ATES) systems use natural water in a saturated and permeable underground layer as the storage medium. The transfer of thermal energy is carried out by extracting groundwater from the aquifer and by ...

Aquifer thermal energy storage: theoretical and operational analysis. Nick Buik. ..., The Netherlands, 379 pp Dickinson JS, Buik N, Matthews MC, Snijders A (2009) Aquifer thermal energy storage: theoretical and operational analysis. Geotechnique 59(3):249-260 Doughty C, Hellstrom G, Tsang CF, Claesson J (1982) A dimensionless parameter ...

2015. The present study is concerned about developing a coupled thermo-hydrogeological numerical model for an Aquifer Thermal Energy Storage (ATES) system consisting of a confined porous aquifer underlain and overlain by impermeable rock media with different thermo-hydrogeological properties.

This study presents energy and exergy analyses of aquifer thermal energy storage (ATES) integrated with a building heating and cooling system. In this regard, a typical bidirectional ATES integrated with a heat pump (HP) is considered in the provision of required heating and cooling demands. The different ATES components and the operating principle are described. ...

Aquifer thermal energy storage (ATES) systems provide a method of improving the performance of more commonly installed mono-direction groundwater heating and cooling systems. Rather than using the prevailing temperature of the abstracted groundwater, ATES systems are bidirectional, therefore allowing for the interseasonal storage of low- and higher ...