Aquifer thermal energy storage wiki

Aquifer thermal energy storage systems can largely contribute to climate-friendly heating and cooling of buildings: Heated water is stored in the underground and pumped up, if needed. Researchers of Karlsruhe Institute of Technology (KIT) have now found that low-temperature aquifer thermal energy storage is of great potential in Germany. ...

Aquifer Thermal Energy Storage (ATES) is an underground thermal energy storage technology that provides large capacity (of order MW t h to 10s MW t h), low carbon heating and cooling to large buildings and building complexes, or district heating/cooling networks.The technology operates through seasonal capture, storage and re-use of thermal energy in shallow aquifers.

The aquifer thermal energy storage (ATES) system is an efficient method to overcome the gap between energy supply and demand over time and space. Heat storage and preservation abilities are key issues of a successful ATES project. However, most of previous studies only focus on heat storage and recovery abilities of the ATES, while the heat ...

OverviewSTES technologiesConferences and organizationsUse of STES for small, passively heated buildingsSmall buildings with internal STES water tanksUse of STES in greenhousesAnnualized geo-solarSee alsoThere are several types of STES technology, covering a range of applications from single small buildings to community district heating networks. Generally, efficiency increases and the specific construction cost decreases with size. UTES (underground thermal energy storage), in which the storage medium may be geological strata ranging from earth or sand to solid bedrock, or aquifers. UTES technologies include:

Fig. 4.2 Basic operational regimes for aquifer thermal energy storage (a) continuous regime, (b) cyclic regime (from Nielsen 2003) 62 4 Aquifer Thermal Energy Storage. 4.2.2 Form of Energy On the basis of the form of energy being stored, three main types of ATES systems can be defined. These are chilled water storage systems (or cold storage ...

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 ...

Aquifer thermal energy storage has the lowest cost compared to other natural forms of underground energy storage [42]. Low-temperature geothermal systems can take on a few different forms, one of which is known as an open-loop system. Compared to using many alternative ground energy systems, one way to attain higher efficiency levels is to ...

As a result, the Aquifer thermal energy storage suitability map in the Halabja-Khurmal sub-basin displays a surface area of 62.1% as strongly suitable, 7.7% as suitable in northern and southern ...

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 ...

Results are presented of a comprehensive thermal impact study on an aquifer thermal energy storage (ATES) system in Bilthoven, the Netherlands. The study involved monitoring of the thermal impact and ... Expand

Aquifer Thermal Energy Storage (ATES) is an increasingly popular type of shallow geothermal energy, which relies on aquifers to seasonally store thermal energy for the heating and cooling of buildings. The Netherlands are currently a world leader for ATES technology, due to a combination of easily accessible aquifer resources, dense urban

Aquifer Thermal Energy Storage is a sustainable energy supply in which heat and cold are stored via a heat exchanger (counter-current device, TSA) in a water-carrying sand package 90 meters deep in the ground. In summer a building is cooled with groundwater from the cold wells. And in winter a building is heated via the same heat exchanger, but ...

Aquifer thermal energy storage systems play an important role for the future energy supply systems. Such systems can decouple energy availability (e.g. fluctuating renewable energy, waste heat) and energy supply in times of demand. In order to fully contribute to the sustainability of energy supply, the essential requirements of energy storages ...

Storage of renewable energy in the underground will reduce the usage of fossil fuels and electricity. Hence, these systems will benefit to CO 2 reduction as well as the reduction of other environmentally harmful gas emissions, like SO X and NO X. ATES, BTES and CTES are three options of Underground Thermal Energy Storage (UTES) systems.

Aquifer thermal energy storage (ATES) is an effort in the aquifer storage and utilization [16]. It is suitable to store clean and renewable energy with unstable supply, and to store surface waste heats generated by industrial productions and life demands but not effectively utilized. Through the timely extraction, the stored energy is allocated ...

With the worlds energy problems still far from being solved, it is commonly agreed upon, that storing energy is a vital part of any possible solution. When discussing the storage, the type of energies must be distinguished. The storage of thermal energy can be accomplished by several means. One of this means is the storing of the thermal energy in naturally occurring water ...

Introduction. Around 40% of the worldwide energy demand is used for heating and cooling (REN21 2017).Aquifer thermal energy storage (ATES) is an efficient alternative to provide heating and cooling to

buildings, with worldwide potential in regions with a temperate climate and suitable geology (e.g., Bloemendal et al. 2015).ATES systems consist of two wells: a warm ...

of aquifer thermal energy storage (ATES) experiments in a confined aquifer near Mobile, Alabama [Molz et al., 1978, 1979, 1981]. The objectives of these experiments were to demonstrate the technical feasibility of the ATES concept, to identify and ...

Aquifer thermal energy storage (ATES) is a source of renewable energy that is extracted from the subsurface using the heat naturally present in the soil and groundwater. Storing heat and cold ...

utilize more subsurface space for thermal energy storage while safeguarding individual system performance. The basic principle is that the loss of thermal energy to the aquifer is reduced when the warm water (or cold water) zones of ATES systems overlap each other. For example, Bakr et al. (2015) found a performance increase of 1%

In the Netherlands, Aquifer Thermal Energy Storage started to be implemented in the early 1980s (Snijders 2005). In first instance, the objective was to store solar energy for space heating in winter. R& D activities and the first demonstration projects were financed within the framework of the National Research Programme on Solar Energy ...

High-temperature aquifer thermal energy storage (HT-ATES) systems are designed for seasonal storage of large amounts of thermal energy to meet the demand of industrial processes or district heating systems at high temperatures (> 100 °C). The resulting high injection temperatures or pressures induce thermo- and poroelastic stress changes ...

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. ATES is particularly suited to provide heating and ...

Abstract. Aquifer thermal energy storage (ATES) has proven to be an effective way to mitigate energy production and supply issues. Drilling branching holes from traditional vertical wells can enhance the injection and production capacity of the ATES system. There are many influencing parameters and evaluation indexes of ATES system with multilateral wells. It is ...

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 can enhance the connectivity of the wellbore to the aquifer. The research creates an unsteady-state 3D model to analyze the novel ATES system"s fluid flow and heat transfer ...

Aquifer Thermal Energy Storage (ATES) systems use resident groundwater in a subsurface aquifer to store

heat energy (Fleuchaus et al., 2018). The basic premise of ATES is: Water is produced from an aquifer; The thermal energy from some external source (e.g. excess renewable energy or industrial waste heat) is transferred to the water;

The disparity between energy production and demand in many power plants has led to increased research on the long-term, large-scale storage of thermal energy in aquifers. Field experiments have been conducted in Switzerland, France, the United States, Japan, and the People"s Republic of China to study various technical aspects of aquifer ...