Can aquifer thermal energy storage be integrated into a cascaded district heating system?

Aquifer storage is suited for medium to large district heating systems with a minimum capacity of 3-15 GWh/a. Best case is achieved using low-ex or cascaded systems. Fig. 19.13 shows an example of the integration of aquifer thermal energy storage into a cascaded district heating system. Figure 19.13.

What is aquifer thermal energy storage?

Aquifer thermal energy storage (ATES) is a natural underground storage technologycontaining 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).

How do aquifer thermal storage systems work?

Aquifer thermal storage systems require drilling at least two wells(one called a warm well and the other a cold well),and larger systems may have multiple wells. The temperature difference between the cold and warm wells (DT) and the flow rate of the wells (Q) determine the heat capacity of the ATES system .

What is high-temperature aquifer thermal energy storage (HT-Ates)?

In comparison with conventional ATES, high-temperature aquifer thermal energy storage (HT-ATES) can significantly enhance the capacity, storage temperature, and efficiency of renewable energy sources (RES) .

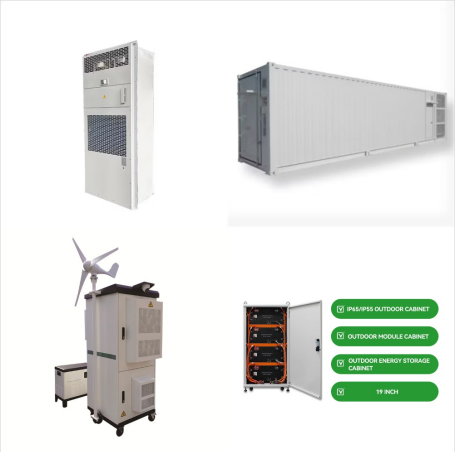
What is Ates aquifer cooling system?

ATES is a proven technology used all over the world,but most are in the Netherlands,where more than 2000 systems are implemented. H.Ö. Paksoy,B. Beyhan,in Advances in Thermal Energy Storage Systems,2015 ATES involves the free cooling or heating from an aquifer - natural groundwater basins.

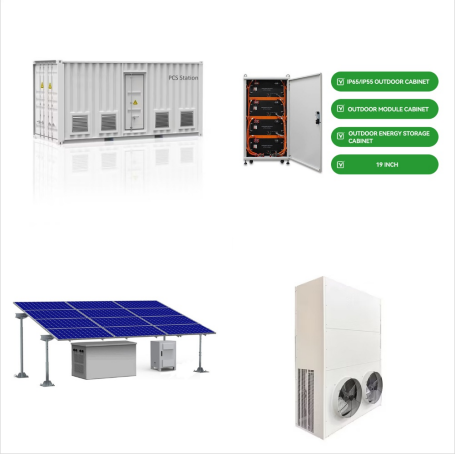
What is a thermal energy storage system (ATES)?

H.Ö. Paksoy,B. Beyhan,in Advances in Thermal Energy Storage Systems,2015 ATES involves the free cooling or heating from an aquifer - natural groundwater basins. They use groundwater as the medium of heat transfer between an external energy source and the aquifer.

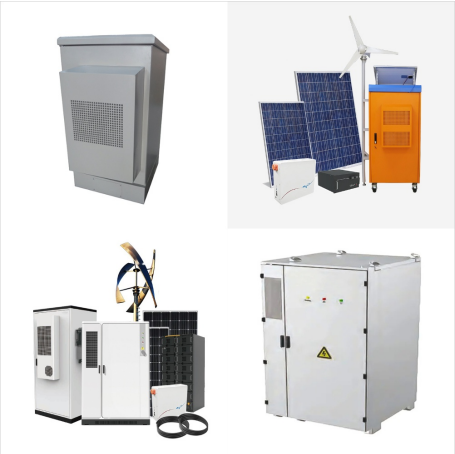
AQUIFER THERMAL ENERGY STORAGE PDF



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

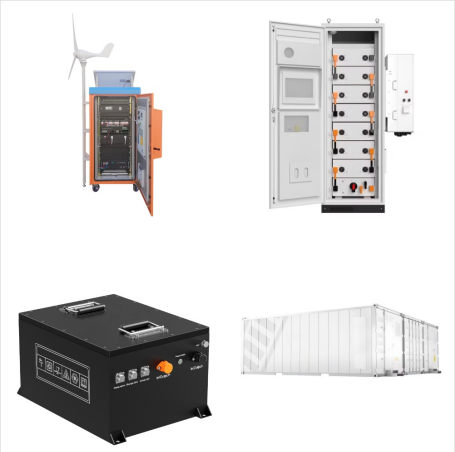


Storage of renewable energy in the underground will reduce the usage of fossil fuels and electricity. Hence, these systems will benefit to CO 2 reduction as well as the reduction of other environmentally harmful gas emissions, like SO X and NO X.ATES, BTES and CTES are three options of Underground Thermal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

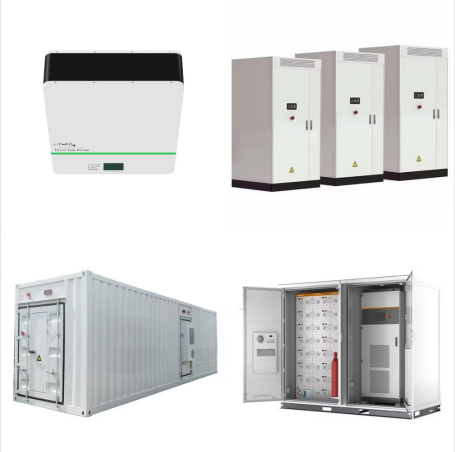


According to stored temperature of water, the ATES can be divided into low- and intermediate-temperature aquifer thermal energy storage (the temperature is less than 50 ?C and the depth of aquifer is below 500 m) and high-temperature aquifer thermal energy storage (the temperature is greater than 50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

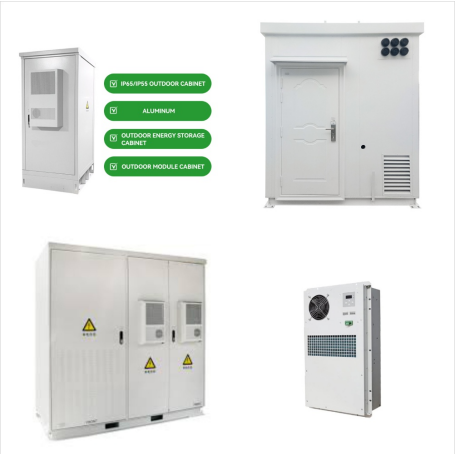
AQUIFER THERMAL ENERGY STORAGE PDF



Aquifer thermal energy storage (ATES) Description of the technology In an aquifer thermal energy storage (ATES), excess heat is stored in subsurface aquifers in order to recover the heat at a later stage. The thermal energy is stored as warm groundwater. The groundwater is also used as a carrier to transport the heat to and from the subsurface.



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



The year 1978 saw the first International Aquifer Thermal Energy Storage (ATES) Workshop, held at the Lawrence Berkeley Laborr.tory (Proceedings, 1978). Current aquifer thermal storage projects are summarized in a periodic Newsletter (ATES Newsletter, 1978, 1979) and two recent review articles (Tsang, 1979; and Tsang, Hopkins and Hellstrom, 1980).

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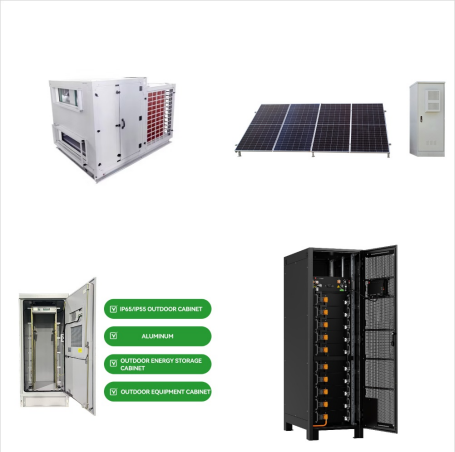
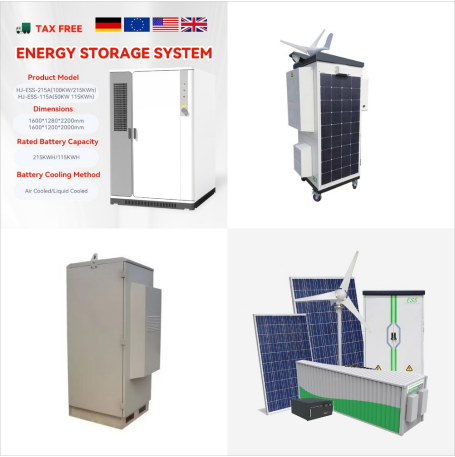
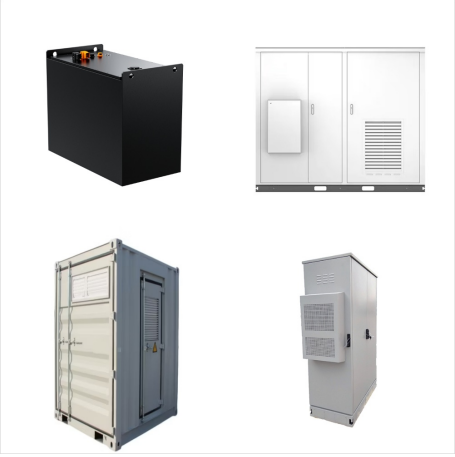


Aquifer Thermal Energy Storage (ATES) is an increasingly popular type of shallow geothermal energy, which relies on aquifers to seasonally store thermal energy for the heating and cooling ???



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



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,

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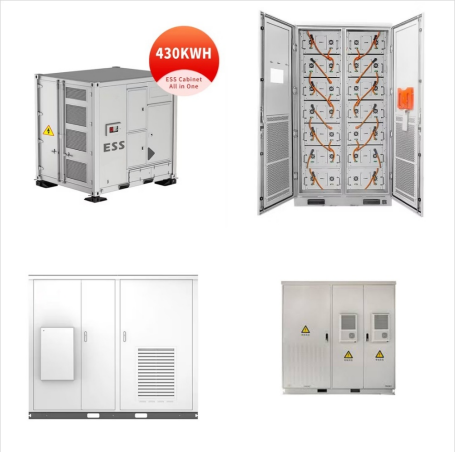
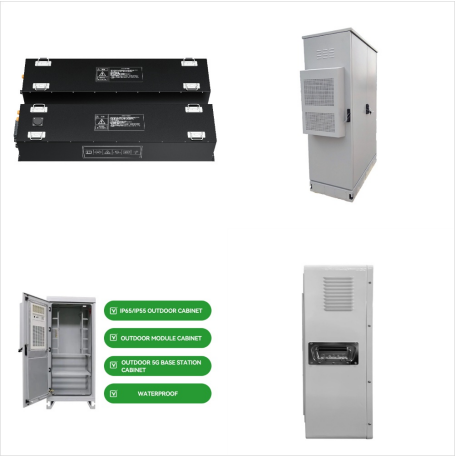
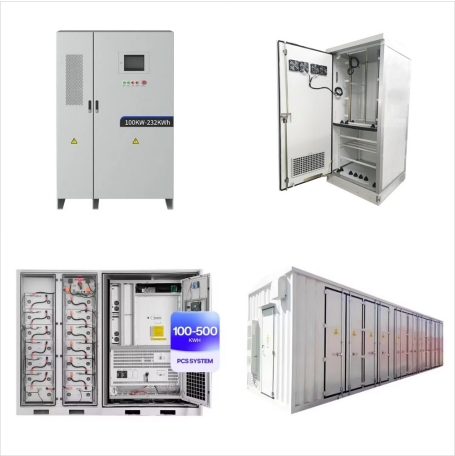


Aquifer thermal energy storage (ATES) systems provide a method of improving the performance of more commonly installed mono-direction groundwater heating and cooling systems. Has PDF. Author. More Filters. More Filters. Filters. Experimental modelling of seasonal thermal energy storage within unconfined aquifer (ATES) Samuel Charlwood G



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 store high amounts of heat to be reused later. HT-ATES requires addressing problems such as variations of the properties of the aquifer, thermal losses and the uplift of the ???



Aquifer Thermal Energy Storage (ATES) is a technology that enables to store and recover thermal energy in shallow aquifers. It is one of the types of underground thermal energy storage, collectively referred to as UTES (Underground Thermal Energy Storage),

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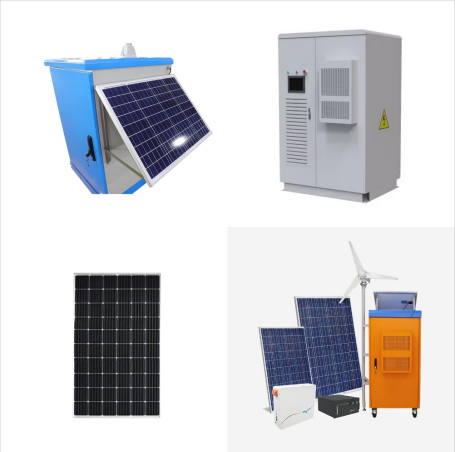
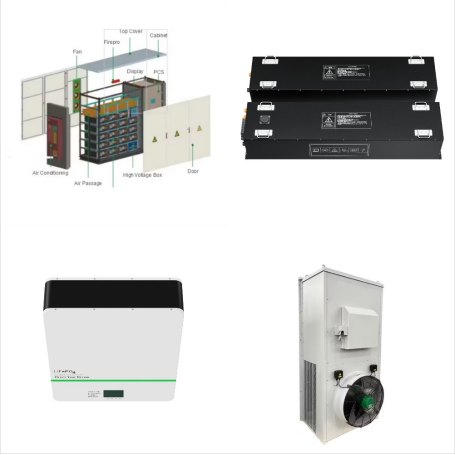
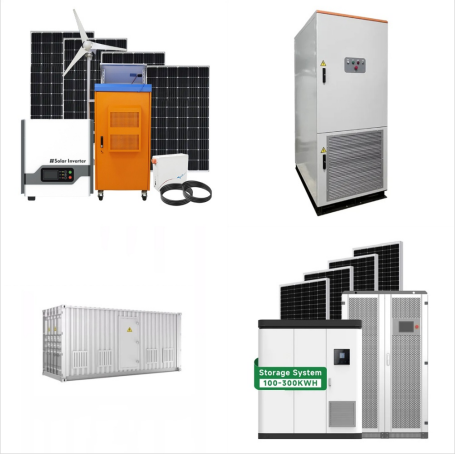


Aquifer thermal energy storage (ATES) is a time-shifting thermal energy storage technology where waste heat is stored in an aquifer for weeks or months until it may be used at the surface. It can

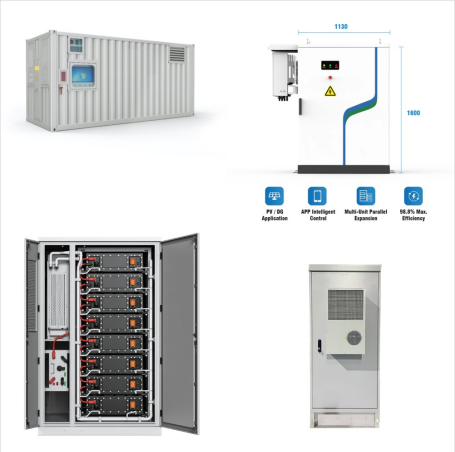


Aquifer thermal energy storage (ATES) Description of the technology In an aquifer thermal energy storage (ATES), excess heat is stored in subsurface aquifers in order to recover the heat at a later stage. The thermal energy is stored as warm groundwater. The groundwater is also used as a carrier to transport the heat to and from the subsurface.

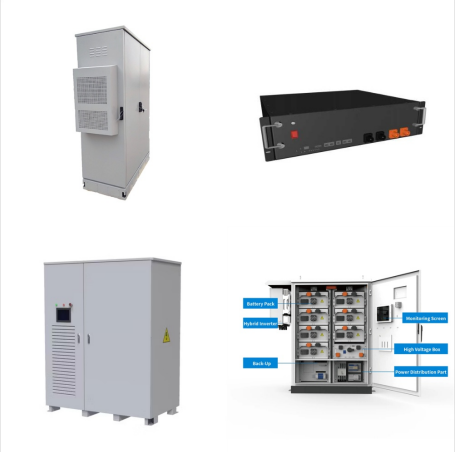


Sustainable and climate-friendly space heating and cooling is of great importance for the energy transition. Compared to conventional energy sources, Aquifer Thermal Energy Storage (ATES) systems can significantly reduce greenhouse gas emissions from space heating and cooling. Hence, the objective of this study is to quantify the technical potential of shallow ???

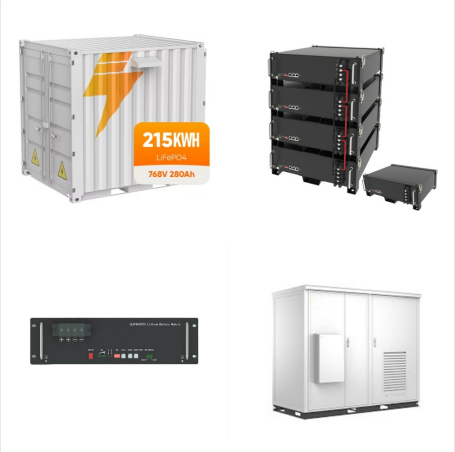
AQUIFER THERMAL ENERGY STORAGE PDF



Aquifer Thermal Energy Storage (ATES) is an open-loop geothermal system allowing long-term storage of thermal energy in groundwater. It is a promising technology for environmentally friendly



Paksoy H, Snijders A, Stiles L (2009). State-of-the-art review of aquifer thermal energy storage systems for heating and cooling buildings. In: Proceedings Effstock, the 11th international conference on thermal energy storage for energy efficiency and sustainability, Stockholm, Sweden. Pesch D, Rea S, Torrens JI, Zavrel V (2017).



One possible implementation type is the use aquifers in medium depth especially in the Tertiary (aquifer thermal energy storage-ATES, e.g., Dickinson et al. 2009;Fleuchaus et al. 2018 Fleuchaus et

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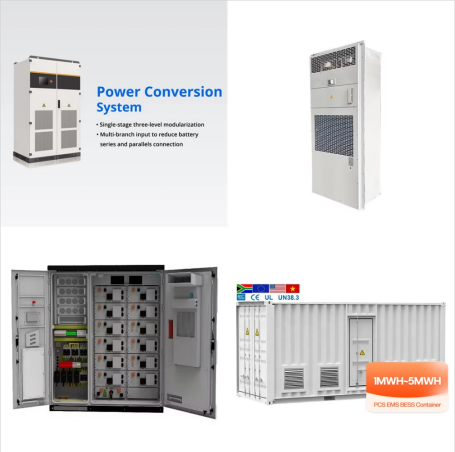
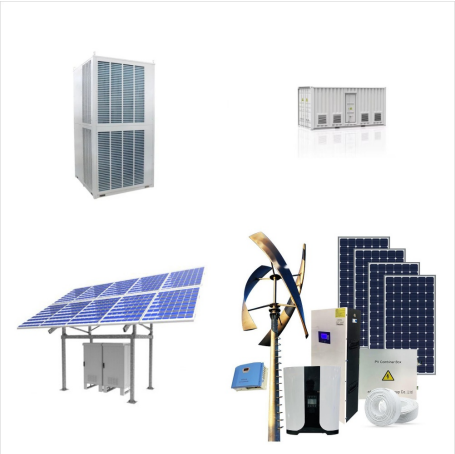


Aquifer thermal energy storage systems play an important role for the future energy supply systems. Such systems can decouple energy availability (e.g. fluctuating renewable energy, waste heat) and energy supply in times of demand. In order to fully contribute to the sustainability of energy supply,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

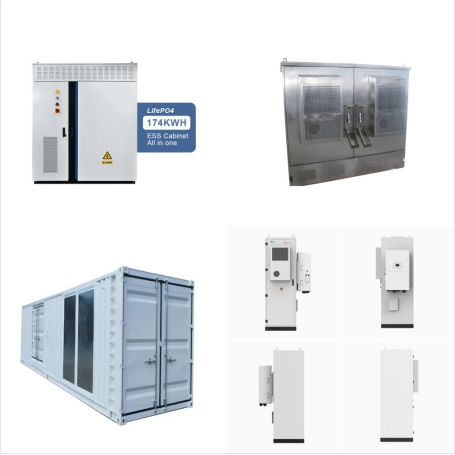
Abstract. Aquifer thermal energy storage (ATES) has proven to be an effective way to mitigate energy production and supply issues. Drilling branching holes from traditional vertical wells can enhance the injection and production capacity of the ATES system. There are many influencing parameters and evaluation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



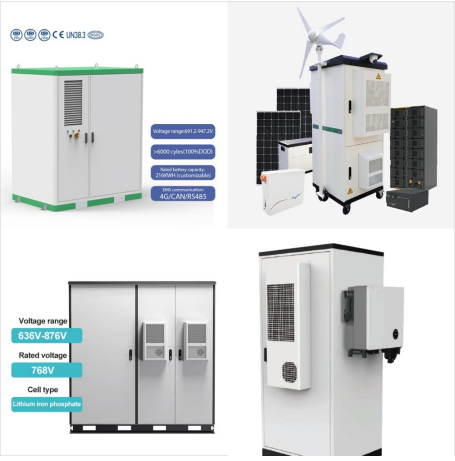
Conceptual model for an aquifer thermal energy storage system. 639 640 Spatial temperature distributions predicted by present solution and Li et al.'s 651 (2010) solution at t = 30, 60, and 90

AQUIFER THERMAL ENERGY STORAGE PDF

PDF | Sustainable and climate-friendly space heating and cooling is of great importance for the energy transition. City-scale heating and cooling with aquifer thermal energy storage (ATES



Sustainable and climate-friendly space heating and cooling is of great importance for the energy transition. Compared to conventional energy sources, Aquifer Thermal Energy Storage (ATES) systems can significantly reduce greenhouse gas emissions from space heating and cooling. Hence, the objective of this study is to quantify the technical potential of shallow ???



Simple dimensionless analytical solutions for the thermal recovery efficiency of Aquifer Thermal Energy Storage (ATES) systems are derived, subject to heat losses caused by thermal diffusion and