Development of underground abandoned space energy storage technology

Can underground space energy storage technology be used in abandoned coal mines?
The underground space resources of abandoned coal mines in China are quite abundant, and the research and development of underground space energy storage technology in coal mines have many benefits.

Is underground space energy storage a promising energy storage technology?
In summary,we believe that among the existing energy storage technologies,underground space energy storage has become one of the most promising energy storage technologies in the futurebecause it can achieve large-scale economic and stable storage of energy.

Why do abandoned mines have subterranean space?
A significant quantity of subterranean space,including underground roadways and tunnels connected to them,has developed in abandoned mines as a result of the ongoing exploitation of coal resources. In China,the concept of "secondary development" is not strong in abandoned mines.

What is coal underground space electrochemical energy storage?
CUEES concept and technical requirements Coal Underground space Electrochemical Energy Storage (CUEES) makes full use of the underground space of coal mining to store or release electrical energy(various types of batteries) through reversible chemical reactions,so as to achieve efficient use of electrical energy,as shown in Fig. 20 [94].

What are the advantages of underground energy storage?
The underground area of the coal mine has reached about 400 km 2, which can accommodate a large number of energy storage equipment and storage media. (2) High utilization rate of underground space: underground energy storage can use underground space, does not occupy surface space, and will not cause too much impact on land use.

Why do we use coal to develop underground space resources?
While making full use of coal to develop underground space resources,it realizes power conversion and storage,stabilizes the power system's cycle and voltage,promotes the circulation of mine water,and guarantees flood storage and water transfer.

Abandoned mining fields can install photovoltaic and wind power, while underground tunnels can storage energy, transforming abandoned mines into a renewable energy support base with electricity generation and storage integrated into a site.

Using the underground space from abandoned mines would provide a new approach for underground energy storage site selection. The installation of energy storage plants requires geological stability and medium

tightness. The energy storage is characterized by its fast-changing periodic load in storages, that is, the high-frequency cyclic load.

Technologies such as: Mechanical Storage (Pumped Hydro Energy Storage, Compressed Air Energy Storage); Underground Thermal Energy Storage and Underground Hydrogen Storage or Underground Natural Gas Storage, are considered large-scale energy storage technologies (Fig. 1), because they can store large amounts of energy (with power ...

The development of underground space energy storage is a key issue to achieve carbon neutrality and upgrade China"s energy structure; (2) Global underground space energy storage facilities can be divided into five categories: salt cavern, water-sealed cavern, aquifer, depleted oil and gas reservoir and abandoned mine; (3) The construction of ...

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Compressed air energy storage (CAES) has the advantages of low construction cost, small equipment footprint, long storage cycle and environmental protection. Exploring the ...

Highlights: (1) We summarize the development status of global underground space energy storage, systematically summarize the types of global underground space energy storage, and compare and analyze the differences between China and other countries in terms of oil and gas storage, contributing to future r...

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International scientists have invented a revolutionary energy storage method by transferring sand into abandoned subterranean mines. Underground Gravity Energy Storage (UGES) is a revolutionary approach that ...

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The development of pumped storage power plants using abandoned mines not only facilitates the effective use of underground space, ecological restoration and local resettlement of workers, but also promotes the large-scale use of renewable energy sources such as wind and light energy. However, in China, this technology is still at the conceptual stage, ...

Underground pumped storage plants in coal mines (UPSHCM) are a technology that uses abandoned or abandoned wells and goafs after coal mining as underground storage reservoirs, uses electricity to pump water to the upper reservoir during low power load, and then releases water to the lower reservoir at peak power load

to produce electricity ...

Exploring the development of CAES technology in underground space is one of the innovative approaches to achieve China"s "dual-carbon" goal. Underground energy storage reservoirs can be classified into salt caverns, aquifers, depleted oil and gas fields, abandoned coal mines, and caverns. With the increasing number of abandoned coal mines in China, the direct closure of ...

China is currently constructing an integrated energy development mode motivated by the low carbon or carbon neutrality strategy, which can refer to the experience of energy transition in Europe and other countries (Xu et al., 2022; EASE, 2022).Various branches of energy storage systems, including aboveground energy storage (GES) and underground ...

The number of abandoned coal mines will reach 15000 by 2030 in China, and the corresponding volume of abandoned underground space will be 9 billion m 3, which can offer a good choice of energy storage with large capacity and low cost for renewable energy generation [22,23].WP and SP can be installed at abandoned mining fields due to having large occupied ...

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