Abandoned mine tunnel energy storage

Can abandoned mines be used as underground reservoirs?
Underground space from abandoned mines can be used as underground reservoirsfor underground pumped storage hydropower (UPSH) and compressed air energy storage (CAES) systems [5,6,7,8,9,10,11].

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 abandoned mine roadway a CAES energy storage cavern?
This study investigated the stability of an abandoned mine roadway as a CAES energy storage cavernwith a numerical model. Being different from previous studies,the EDZ was partitioned into different zones according to their damage degree and a P-EDZ numerical model was established.

How can abandoned mine facilities be used to generate energy?
Finally,a CAES plant could be established,using the upper mine galleries for underground air storage; the fact that Lieres is a "dry mine" is ideal for this type of system. Thus,the abandoned mine facilities are efficiently used to generate both electrical and thermal renewable energy. Fig. 5.

Can abandoned mines be used for energy storage?
For more information on the journal statistics,click here . Multiple requests from the same IP address are counted as one view. Million cubic meters from abandoned mines worldwide could be used as subsurface reservoirs for large scale energy storage systems,such as adiabatic compressed air energy storage (A-CAES).

How stable is a cavern from an abandoned mining tunnel?
Key parameters to the stability of the CAES cavern are identified. Compressed air energy storage (CAES) is a buffer bank for unstable new energy sources and traditional power grids. The stability of a CAES cavern is a key issue to cavern safety. However,the stability of a cavern from an abandoned mining tunnel has not been well studied.

We have studied three plans for re-use of the abandoned mine roadway tunnels as an energy center. These are the thermostat plan, the thermal accumulator plan, and the CAES plan. Calculations show that the thermostat plan can provide over 15,000 m 2 of building air-conditioning/heating load for each kilometer of roadway, but electric power is needed to run the ...

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 ...

A new sort of large-scale energy storage plant is the abandoned mine gravity energy storage power station. It

features a simple concept, a low technical threshold, good reliability, efficiency, and a huge capacity [27].The abandoned mine gravity energy storage power station lifts the weight through a specific transportation system to drive the generator set to ...

Existing underground mines comprise of various spaces, including shifts, tunnels, and goafs. In the construction of a semi-underground pumped storage hydropower (PSH) plant using closed underground mine, ensuring the stability of the surrounding rock and its ability to prevent seepage is crucial (Li et al. 2023; Nikolaos et al. 2023) nsequently, the shafts, shaft ...

Abandoned mine pumped storage is a technology that uses the space and water resources of abandoned mines to realize the storage and regulation of electric energy. [11]. In comparison to conventional pumped storage, pumped storage in abandoned mines exhibits a multitude of notable advantages.

Fig. 2 is a schematic diagram of CAES constructed by an abandoned mine tunnel. ... the daily air leakage in the compressed air storage energy cavern of Yungang Mine with high polymer butyl rubber ...

Underground spaces in coal mines can be used for water storage, energy storage and power generation and renewable energy development. In addition, the Chinese government attached great importance to the reuse of abandoned mines as well as the transformation of coal enterprises and has introduced a series of supporting policies [[23], [24], ...

The use of abandoned underground mines as facilities for storing energy in form of compressed air has been investigated by Lutynski et al. [18] and Ishitata et al. [20] pared to underground storage caverns, CAES reservoirs are subjected to relatively high-frequency load cycles on a daily or even hourly basis.

Abandoned mines are already being used for various purposes, ranging from ultimate waste disposal to energy storage and the heating and cooling of spaces. Some examples of the ...

Million cubic meters from abandoned mines worldwide could be used as subsurface reservoirs for large scale energy storage systems, such as adiabatic compressed air energy storage (A-CAES). In this paper, analytical and three-dimensional CFD numerical models have been conducted to analyze the thermodynamic performance of the A-CAES reservoirs in ...

The use of abandoned coal mine tunnels as underground compressed air energy storage (CAES) facilities has garnered significant attention given that it effectively repurposes unused underground space and enhances the efficiency of renewable energy utilization. However, existing coal mine tunnels, without optimization and retrofitting, may not meet the stability ...

This study focuses on the renovation and construction of compressed air energy storage chambers within abandoned coal mine roadways. The transient mechanical responses of underground gas storage ...

Unlocking the potential of abandoned mines for long-term energy storage. (Credit: Dion Beetson on Unsplash) According to the US Department of Energy, pumped storage hydropower (PSH) accounted for 93% of all utility-scale energy storage in the US in 2021. ... tunnels, turbines, generators - and energy storage - dam, water, land - costs are ...

Researchers in Michigan Technological University"s Keweenaw Energy Transition Lab answer the urgent need for reliable energy grids with PUSH, or pumped underground storage hydro, a global-first closed-loop ...

Energy storage in the long-term. The key takeaway here, however, is that while energy storage methods - such as batteries - lose energy via self-discharge over long periods; ...

The CAES plan proposes using the discarded coal mine tunnel as a peaking power station with an energy storage density over 7000 kJ/m 3. It can be concluded that presently abandoned coal mines could be reformed into future energy centers for a city.

Recently, the NDRC and the NEA"s Opinions on Improving the System, Mechanism and Policy Measures for the Green and Low-carbon Energy Transformation clearly pointed out that the research and demonstration of new energy storage projects, such as the transformation of energy storage in abandoned mines, has provided complete policy support ...

Fig. 2 is a schematic diagram of CAES constructed by an abandoned mine tunnel. For example, Xu et al. [17] established a three-dimensional model for the 60 MW CAES project of an abandoned coal mine in Yungang, Shanxi Province and compared the thermal responses of two schemes of CAES caverns in abandoned tunnels.

The use of abandoned coal mine tunnels as underground compressed air energy storage (CAES) facilities has garnered significant attention given that it effectively repurposes unused underground space ... Expand

@article{Xu2021ThreedimensionalTA, title={Three-dimensional thermo-mechanical analysis of abandoned mine drifts for underground compressed air energy storage: A comparative study of two construction and plugging schemes}, author={Yingjun Xu and Shuwei Zhou and Caichu Xia and Hai-bin Zhao and Xiaodai Xue}, journal={Journal of Energy Storage ...

Semantic Scholar extracted view of "Obstacle identification for the development of pumped hydro storage using abandoned mines: A novel multi-stage analysis framework" by J. Xue et al. ... {Jing Hua Xue and Xue-liang Hou and Jianli Zhou and Xiaobing Liu and Yu Guo}, journal={Journal of Energy Storage}, year={2022}, url={https://api ...

The challenges associated with employing abandoned mines as lower reservoirs are multifaceted. The foremost challenge stems from limited knowledge about the current state of the mines due to post-mining processes, such as weathering, dissolution, hydration, leaching, swelling, slacking, subsidence, creeping along faults, gas migration, and ...

There are two kinds of thermal reservoir in abandoned mines, namely abandoned tunnels and mined out areas. For abandoned tunnel, because of its plenteous data and simple geometry, heat transfer and flow in tunnels can be simulated with a conventional model. ... Exploring the concept of compressed air energy storage (CAES) in lined rock ...

The share of new energy in China"s energy consumption structure is expanding, posing serious challenges to the national grid"s stability and reliability.As a result, it is critical to construct large-scale reliable energy storage infrastructure and smart microgrids. Based on the spatial resource endowment of abandoned mines" upper and lower wells and the principle characteristics of the ...

The underground space mined from coal mines as energy storage (CUCAES) can not only effectively utilize the original underground space and surface industrial equipment of ...