Copper mine tunnel air energy storage

A large number of voids from closed mines are proposed as pressurized air reservoirs for energy storage systems. A network of tunnels from an underground coal mine in ...

Determining the airtightness of compressed air energy storage (CAES) tunnels is crucial for the selection and the design of the flexible sealing layer (FSL). However, the current airtightness calculations for flexible sealed CAES tunnels often ignore the process of high-pressure air penetration and accumulation in the lining and surrounding rock after passing ...

(LRC)(CAES)? CAES ? CAES ? ...

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 ...

The Rio Tinto Kennecott mine in the United States, an open pit copper, gold, silver and molybdenum mine. Sunlight and Clouds on the Rock Face at Kennecott Copper Mine, by Phil Scoville, is used under the CC BY 2.0 license. This image has been modified and is available for re-use under the same license.

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 ...

In recent years, as deep mineral resource mining has become the norm, high geothermal conditions in deep mines have been frequently reported [1], [2].Tunnel excavation is the most common operation in underground resource exploitation, with the total length of newly excavated tunnels in Chinese mines exceeding 12,000 km per year [3] certain deep mines, ...

The primary causes of heat hazards in mines are as follows [10], [11], [12]: (1) heat exchange between the airflow and high-temperature surrounding rock of the tunnel; (2) airflow self-compression heating by friction; (3) heat released from the electromechanical equipment; (4) heat released from exothermic oxidation reactions of minerals; (5) heat released from mine ...

The surrounding rock of these air intake tunnels exhibits unique energy storage characteristics [4], capable of cyclically storing and releasing air energy across seasons and day-night cycles. This facilitates pre-treatment of air flowing through the tunnels, achieving temperature variations up to 20 °C and significant

dehumidification effects ...

A method for using a coal mine underground tunnel for compressed air energy storage: first reconstructing the cross section of the tunnel, specifically comprising: implementing high...

Compressed air energy storage (CAES) in underground mine tunnels using the technique of lined rock cavern (LRC) provides a promising solution to large-scale energy ...

There was room for only one passenger in the air-conditioned cab. I opted to go al fresco on the way in to get a true experience. We drove for 10 minutes down a completed open-pit zinc mine to the portal entrance of the underground mine, ...

Two main advantages of CAES are its ability to provide grid-scale energy storage and its utilization of compressed air, which yields a low environmental burden, being neither toxic nor flammable.

Isobaric CAES is proposed to use abandoned coal mine tunnel efficiently. Energy recovery efficiency for isobaric CAES is 1.17 times of isochoric CAES. Energy storage density ...

Regarding the practice of using abandoned coal mines for gas storage, in 2019, the Yungang coal mine in Shanxi Province started constructing the first compressed air energy storage power station in China by using ...

Thermodynamic analysis of an isobaric compressed air energy storage (I-CAES) combined with low grade waste heat; Integration of compressed air energy storage with wind ...

The Promise of Compressed Air. While the potential of wind and solar energy is more than sufficient to supply the electricity demand of industrial societies, these resources are only available intermittently.Adjusting energy ...

In this paper, the compressed air network in the main compressor house of the Qaleh-Zari copper mine in Iran was investigated. To achieve this goal, the compressed air consumption in ...

Aiming at the problem that geothermal energy is difficult to meet the demand, Bao et al. [28] put forward a geothermal energy supply strategy based on underground wastewater, and used deep mining copper mine to provide thermal energy for large buildings, which improved the utilization efficiency of thermal energy derived from underground ...

Underground energy storage gives end-of-life mine shafts, which otherwise face costly infilling and decommissioning costs, a second life. Copper $ 4.3495 / lb -0.66% Brent Crude Oil $ 62.59 / bbl ...

The average buried depth of the proposed gas storage tunnel is 300 m, and the fluctuation range of gas

pressure in the tunnel is 4.5-10 MPa during the operation of the system. The gas storage tunnel is enlarged and reconstructed on the ...

A novel technique called Underground Gravity Energy Storage turns decommissioned mines into long-term energy storage solutions. Copper $ 4.523 / lb 3.30% Brent Crude Oil $ 64.01 / bbl 2.25%

Compressed air energy storage (CAES) in underground mine tunnels using the technique of lined rock cavern (LRC) provides a promising solution to large-scale energy storage. A coupled thermodynamic and thermomechanical modelling for CAES in mine tunnels was implemented.

The repurposing of abandoned open-pit coal mines into pumped storage hydropower (PSH) can help with the storage of renewable energy, improve mine environments, and provide added economic value.

: Compressed air energy storage (CAES) in underground mine tunnels using the technique of lined rock cavern (LRC) provides a promising solution to large-scale energy storage. A coupled thermodynamic and thermomechanical modelling for CAES in mine ...

A CAES cavern can be constructed from an abandoned mining tunnel if the sealing and stability of the roadway are carefully evaluated and properly repaired [12,13]. ... This numerical simulation model for the compressed air energy storage in abandoned mines is verified by the simulation results of the Korean CAES pilot test project where Kim et ...

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 energy storage systems in use include hydroelectric pumping storage, wind, and compressed air. These sites represent independent and

This method utilizes mine water as a cold source with low energy consumption, low initial investment, and low operating costs; it can also recover the residual heat in mine groundwater; however ...

CAES, a long-duration energy storage technology, is a key technology that can eliminate the intermittence and fluctuation in renewable energy systems used for generating electric power, which is expected to accelerate renewable energy penetration [7], [11], [12], [13], [14].The concept of CAES is derived from the gas-turbine cycle, in which the compressor ...

Applications of TBMs in the mining industry have previously been reviewed by Handewith, 1980, Stack, 1982, Robbins, 1984, Cigla et al., 2001, Home and Askilsrud, 2011, Brox, 2013.However, only brief introductions to TBM applications in the mining industry (e.g. TBM type, diameter and tunnel length) are presented and general technical considerations of using ...

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 ...

In 2019, the Chuquicamata mine - one of the largest copper mines in the world - was converted from an opencast mine to an underground operation. ... In 2015, TAKRAF as contracted to supply the principal ore ...

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