

Can compressed air energy storage be used in underground mine tunnels?

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. Thermodynamic analysis of air during CAES operation was carried out.

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.

Do EDZ partitions affect cavern stability in unlined abandoned coal mines?

The model was verified by the simulation results available in literature and demonstrated its capability in evaluating the influence of the EDZ partitions in unlined abandoned coal mines on the stability of CAES cavern. Based on these investigations, following conclusions can be obtained.

The mine water from abandoned coal mines can also be used for the development of Underground Pumped Storage Power (UPSH) or Compressed Air Energy Storage (CAES) plants [18-22]. Large amounts of stored water at stable temperature and low enthalpy are suitable for the supply of sustainable thermal energy in surrounding buildings.

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]. ... Research status and development trend of compressed air energy storage in abandoned coal mines. 2023, Meitan Kexue Jishu/Coal Science and Technology (Peking) View all citing ...

In this paper, four mining levels in a closed coal mine in the Asturian Central Coal Basin (NW Spain) have been selected as a case study to investigate the technical feasibility of underground compressed air energy storage systems. First, in order to determine the suitable level and type of concrete lining, a numerical model has been established to analyze the ...

During the last decades, the Asturian Central Coal Basin (ACCB) has been a highly exploited coal mining area by means of underground mining and its network of tunnels extend among more than 30 mines.

A network of tunnels from an underground coal mine in northern Spain at 450 m depth has been selected as a case study to investigate the technical feasibility of adiabatic compressed air energy ...

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 ...

The concept of air storage in isolated workings of closed coal mine is presented taking into account availability of such places in the Silesian Coal Basin of southern Poland. The article also discusses major challenges of such concept such as insulation of underground workings, geomechanical stability of workings and site availability.

Many mines have introduced the tunnel boring machine (TBM) to improve the efficiency of rock tunneling because of its high propulsion capacity, safe working space, and intelligent equipment. In contrast, the operating environment of coal mines is often under complex geological conditions such as high ground stress, large depth of burial, high temperature, ...

Under the operating pressure of 4.5-10 MPa, the daily air leakage in the compressed air storage energy cavern of Yungang Mine with high polymer butyl rubber as the sealing material is 0.62% ...

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

Million cubic meters from abandoned mines worldwide could be used as subsurface reservoirs for large scale energy storage systems, such as adiabatic compressed ...

The network of tunnels of a mine facility has an unusual geometry for a water storage ... 18 fluids interacting inside the tunnels, water and air. This paper explores the viability of a network of ...

The article gives a brief overview of current developments and projects of Compressed Air Energy Storage (CAES). Typical CAES configurations such as Adiabatic CAES and Diabatic CAES are described. The concept of air storage in isolated workings of closed coal mine is presented taking into account availability of such places in the Silesian Coal Basin of ...

Semantic Scholar extracted view of "Design issues for compressed air energy storage in sealed underground cavities" by P. Perazzelli et al. Skip to search ... Response of Compressed Air Energy Storage in the Interaction between Gas Storage Chambers and Horseshoe-Shaped Tunnels in an Abandoned Coal Mine. Fuqing Li Fufeng Li +7 authors ...

During the last decades, the Asturian Central Coal Basin (ACCB) has been a highly exploited coal mining area by means of underground mining and its network of tunnels extend among more than 30 mines. Parts of this infrastructure will soon become available for alternative uses since most of the coal mining facilities in Spain will fade out in 2018.

A network of tunnels from an underground coal mine in northern Spain at 450 m depth has been selected as a

case study to investigate the technical feasibility of adiabatic ...

To evaluate the stability of a lined rock cavern (LRC) for compressed air energy storage (CAES) containing a weak interlayer during blasting in the adjacent cavern, a newly excavated tunnel-type LRC was taken as the research object. By combining similar model tests and numerical simulation, the dynamic responses and deformation characteristics of the ...

Operationally, abandoned coal mines may safely store compressed air if the shafts and drifts are completely sealed from remaining coal seams to mitigate risks of tunnel wall leaks and ceilings ...

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 northern Spain at 450 m depth has been selected as a case study to investigate the technical feasibility of adiabatic compressed air energy storage (A-CAES) systems.

The CAES plan proposes using the discarded coal mine tunnel as a peaking power station with an energy storage density over 7000 ... A compressed air energy storage power station located in Huntorf, Germany, operates with a pressure of the compressed air in the range from 4.5 to 6.5 ...

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 ...

rational transformation of coal mine tunnels. In this paper, by leveraging the mining engineering case of Pan Yi, we utilized numerical simulation to analyze the stress and deformation of coal mine tunnels when used as compressed air storage facilities. We proposed feasible transformation solutions and

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 ...

Compressed air energy storage (CAES) is attracting attention as one of large-scale renewable energy storage systems. Its gas storage chamber is one of key components for its success. A successful utilization of an abandoned coalmine roadway depends on the stability of the gas storage chamber.

A Study on the Transient Response of Compressed Air Energy Storage in the Interaction between Gas Storage Chambers and Horseshoe-Shaped Tunnels in an Abandoned Coal Mine Fuqing Li Fufeng Li +7 authors Yinhang Duan

Harmful gases may potentially be present in a coal mine that can be combustible, explosive, asphyxiating and/or toxic [116] such as methane, carbon dioxide, hydrogen sulfide or radon [117]. Methane and carbon

dioxide being the predominant mine gas contents in coal mining [117, 118].

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 northern Spain at 450 m depth ...

Mining coal. Coal miners use large machines to remove coal from the earth. Many U.S. coal deposits, called coal beds or seams, are near the earth's surface, but others are deep underground. Modern mining methods allow U.S. coal miners to easily reach most of the nation's coal reserves and to produce about three times more coal in one hour than in 1978.

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