

# COAL MINE TUNNEL ENERGY STORAGE



A diameter of 1 m for vertical ventilation shafts is acceptable with respect to the air pressure loss (211 Pa). Based on the reckoning of the existing coal mine goaf space in China, it has been found that developing hybrid pumped-hydro energy storage plants using abandoned coal mine goafs for daily regulation is feasible in the short term.



Those abandoned coal mine underground spaces can be re-utilized as energy storage caverns. This can also bring new infrastructure investments and employment opportunities in renewable energy [8,15]. Thus, the re-utilization of abandoned underground coal mine spaces as storage caverns benefits both coal mines and renewable energy industries [9].



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], ???



Energy storage in underground coal mines in NW Spain: Assessment of an underground lower water reservoir and preliminary energy balance. Both models are similar, with small geometric variations. In model A, each transversal tunnel has a slope of 2% and a ventilation shaft, while in model B the transversal tunnels are horizontal, and all the



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Energy storage is a pivotal component in the advancement of sustainable energy sources [3]. The energy storage system addresses several challenges associated with the integration of new energy sources into the grid [4] provides a solution to the intermittent and unstable problems that have been a barrier to the adoption of new energy power generation.



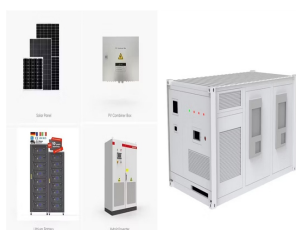
In this paper, four mining levels in a closed coal mine in the Asturian Central Coal Basin (NW Spain) have been selected as a case study to investigate the technical feasibility of underground



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.



3 ? Understanding the conditions under which different regions of coal and rock within the energy storage structure fail and potentially trigger rockburst due to mining disturbances is ???



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As one of the main energy production and supply sector in China, the coal industry consumes huge energy during the period of coal mining. In 2016, the power consumption of coal mining and coal preparation is as high as 84.704 billion kWh [1]. The high energy consumption of coal mining brings

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serious environmental pollution issues [2].Therefore, the ???

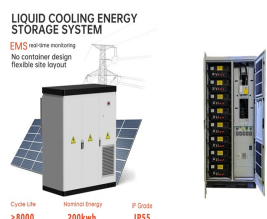
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Luo et al. [79] proposed the early idea of using abandoned coal mines for energy storage to address the need for grid peaking and valley filling in the urbanization of developed mining areas in China. They found that the abandoned coal mine can be transformed into an urban energy center that integrates heat energy and electric energy dispatching.



tained for a mine tunnel with 10,000 m<sup>3</sup> of volume at 500 m depth. The ADELE project The ADELE project was studied in Germany to install an A-CAES plant with a storage capacity of 360 MWh



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 proposed energy storage system uses a post-mine shaft with a volume of about 60,000 m<sup>3</sup> and the proposed thermal



energy storage caverns, providing guidance for subsequent research. Wang [7,8] focused on the coupled multi-physics issues in compressed air energy storage in abandoned coal mine underground chambers, and they extensively studied the thermodynamic laws governing air leakage, underground chamber temperature, and pressure changes.



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 abandoned mines, but also reduce the price of building a gas storage facility. In 2019, Shanxi, China launched

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the world's first coal mine tunnel compressed air energy

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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 the Mine II, the tunnel and the intersection of the tunnel with the ventilation shaft is excavated in altered shale. In this model, a weak plane with a dip of 45° and a dip direction parallel to the tunnel axis has been considered. Energy storage in underground coal mines in NW Spain: assessment of an underground lower water reservoir



Energy storage in underground coal mines in NW Spain: Assessment of an . 1. vertical shafts, it would be ne cessary to build a new a ccess tunnel from the outside to the powerhouse ca vern



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, ???



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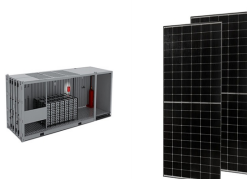
Pumped storage Energy storage Hydropower Coal mining Underground water reservoir abstract During the last decades, the Asturian Central Coal Basin (ACCB) has been a highly exploited coal mining area by means of underground mining and its ???



In the context of sustainable development, revitalising the coal sector is a key challenge. This article examines how five innovative technologies can transform abandoned or in-use coal mines into sustainable energy centres. From solar thermal to compressed air energy storage, these solutions offer a path to a more sustainable future while addressing the decline ???



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.



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 ???



The completion of a 1.2 km long exploratory tunnel is the latest milestone in SSE's ongoing moving the project closer to offering a huge boost for the UK's renewable energy storage," added John Ord, Business Director, Energy, Stantec. Energy Vault and Carbosulcis to Develop 100MW Energy Storage System at Former Coal Mine in Sardinia. 5

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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 ???



@article{Schmidt2024TechnicalFO, title={Technical feasibility of lined mining tunnels in closed coal mines as underground reservoirs of compressed air energy storage systems}, author={Falko Schmidt and Javier Men{"e"}ndez and Heinz Konietzky and Zhongming Jiang and Jes{"u}s Manuel Fern{"a"}ndez-Oro and Laura V. Alvarez and Antonio Bernardo-S