Underground energy storage solutions for open-pit coal mines

What are underground energy storage and geothermal applications?
Underground energy storage and geothermal applications are applicable to closed underground mines. Usually,UPHES and geothermal applications are proposed at closed coal mines,and CAES plants also are analyzed in abandoned salt mines. Geothermal power plants require flooded mines,which generally have closed more than 5 years ago.

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.

What is coal underground thermal energy storage?
Coal underground thermal energy storage (CUTES) is a form of energy storage that makes extensive use of the underground highways in closed mines as a place to store energy and to offer heating and cooling in the winter and summer months, respectively.

What are closed mines used for?
Closed mines can be used for underground energy storage and geothermal generation. Underground closed mines can be used as lower water reservoir for UPHES. CAES systems store energy in the form of compressed air in an underground reservoir. The geothermal use of water from a mine allows heating and cooling nearby buildings.

Can coal mining space be used for electrochemical energy storage?
The use of coal mining space for electrochemical energy storage has not yet been commercialized,and four key problems still need to be broken through,namely,site safety evaluation of underground space for coal development,construction of electrochemical energy storage geological bodies.

Why is the underground space of a coal mine important?
This is because the underground space of a coal mine has the following advantages: (1) Rich space: the underground coal mine has a vast space,especially underground cavities such as goafs and abandoned roadways,which can be used to store a large amount of energy.

Coal is ranked by its degree of transformation or maturity, increasing in carbon content from... Go to definition. is extracted from underground or open-pit mines. In underground mines, vertical shafts are sunk and then galleries excavated horizontally. In open-pit mines, benches are drilled to allow trucks to circulate. Underground Mines Are ...

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. Construction of PSH plant will change the water level of the abandoned pit, which is envisaged as the lower reservoir, thus influencing the slope stability.

New studies on the framework of a circular economy have led to found new possibilities for closured coal mines in historical mine districts and mine water can be considered as a ...

Energy storage; Hydrogen; Nuclear power; Power networks; ... As a mine moves from open pit to underground, it"s likely for the volume and grade of ore to change. ... This should be a more cost and energy efficient solution for both hoisting and processing but is not always possible due to space requirements or mineralogy." ...

Alongside, the power generation capacity of underground water storage and energy storage in coal mines has been systematically studied. The energy storage and generation from abandoned coal mines and mine reservoirs is about 1.5 times of China"s total annual power generation in 2014 (Ge et al., 2020).

The results show that 87% of China"s coal is mined by underground methods, with an average production capacity of 0.93 Mt/a per mine. Open pit mining accounts for 13%, with an average mine ...

Potential of repurposing abandoned coal mines, as lower reservoirs for UPSPs. Exploring cyclical pumping & discharge processes in UPSPs: hydraulic discharge, cyclic ...

The DT-based frameworks for monitoring critical infrastructure is well-needed these days. Since, current literature lacks in the development of such frameworks for monitoring the open-pit coal mines for safety reasons and predictive maintenance of mines, our proposed work contributes in monitoring mines and provides potential indicators for safety management ...

Energy storage systems allow the production of electricity to be managed according to ... A hypothetical UPSH plant whose underground reservoir is an open pit mine is considered. Of course, actual properties of open pit mines are more complex, but the goal of the paper is, at this stage, to assess the general relevance of groundwater exchanges ...

3 Haerwusu Open-Pit Coal Mine, China Shenhua Energy Co. Ltd., Ordos 017100, China * Correspondence: cumtzhw@cumt .cn (W.Z.); imjiskani@hotmail (I.M.J.) ... Both underground and surface mining operations exacerbate it due to the generation of large amounts of dust [6]. The dust accumulated in various locations in

The concept of cleaner production aims at preventing the production of waste while increasing efficiencies in the use of energy, water, resources, and human capital (Cui et al., 2019).Abandoned mine reutilization is an important aspect of cleaner production practices because it can fully tap the potential and vitality of idle resources, save social costs, provide a ...

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There are different ways open-pit mining can be carried out depending on the type of mineral and the surrounding environment. 1. Open-pit Metal Mining. This type of open-pit mining is used to extract metals such as copper, gold, iron, and aluminum. These metals are important for making electronics, vehicles, and construction materials.

A novel technique called Underground Gravity Energy Storage turns decommissioned mines into long-term energy storage solutions, thereby supporting the sustainable energy transition. Share ...

Sources of emissions include seepage from coal seams exposed in surface or open pit mines; drainage systems used to reduce the methane content of coal deposits; ventilation systems (where methane is extracted and vented from underground coal mines as a safety measure); post-mining activities such as processing, storage and transport when ...

From capturing sunlight in vast expanses of open-pit mines, to optimising energy production through compressed air storage in underground mines, these innovations hold the ...

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 ...

An international team of researchers has developed a novel way to store energy by transporting sand into abandoned underground mines. The new technique, called Underground Gravity Energy...

Repurposing a closed mine as lower reservoir is a cost-effective way for the construction of pumped storage hydropower (PSH) plant. This method can eliminate the ...

Underground pumped storage hydroelectricity (UPSH) plants using open-pit or deep mines can be used in flat regions to store the excess of electricity produced during low-demand energy periods. It is essential to ...

With the gradual depletion of energy resources in central and eastern China, the western mining area has gradually become China"s primary coal source, producing more than 70% of China"s coal, thus promote the country to build a large number of 10-million-ton high-intensity mines in the western mining area.

Drilling. Drilling is one of the initial phases in open pit mining, involving the use of diesel-powered drill rigs and generators. The combustion of diesel fuel in these rigs results in the emission of CO 2, methane (CH 4), and nitrous oxide (N 2 O). Although CO 2 is the primary emission, CH 4 and N 2 O have significantly higher global warming potentials despite being ...

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UNESCO - EOLSS SAMPLE CHAPTERS CIVIL ENGINEERING - Vol. II - Surface Mining Methods and Equipment - J. Yamatomi and S. Okubo ©Encyclopedia of Life Support Systems (EOLSS) SURFACE MINING METHODS AND EQUIPMENT J. Yamatomi and S. Okubo University of Tokyo, Japan Keywords: Mining method, surface mining, open pit ...

The proposed technology, called Underground Gravity Energy Storage (UGES), can discharge electricity by lowering large volumes of sand into an underground mine through the mine shaft.

The use of underground space energy storage in coal development should be based on the comprehensive consideration of mine well type, space depth, geological structure, ...

Solutions across the mining life cycle Explore. Explore Micromine Geobank. Micromine Geobank Geoscience data logging and management. Micromine Origin. ... Open pit and underground mines are often in remote locations that require miners to work and live on mining camps for long periods of time, which can cause psychological problems that ...

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