Compressed air energy storage system patents

As renewable energy production is intermittent, its application creates uncertainty in the level of supply. As a result, integrating an energy storage system (ESS) into renewable energy systems could be an effective strategy to provide energy systems with economic, technical, and environmental benefits. Compressed Air Energy Storage (CAES) has been ...

@article{osti_1531732, title = {High-efficiency liquid heat exchange in compressed-gas energy storage systems}, author = {Bollinger, Benjamin and Magari, Patrick and McBride, Troy O.}, abstractNote = {In various embodiments, efficiency of energy storage and recovery systems employing compressed air and liquid heat exchange is improved via control of the ...

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Patent Document 1 discloses an adiabatic compressed air energy storage (ACAES) power generation device that recovers heat from compressed air before storing the compressed air and reheats the compressed air when the stored compressed air is supplied to the turbine. Since the ACAES power generation device recovers the compression heat and uses the compression ...

A compressed-air energy-storage system, comprising: a variable-nozzle expander configured to receive an airflow at a first pressure and partially expand said airflow at a second pressure, said second pressure being lower than said first pressure, expansion of said airflow in said variable-nozzle expander producing useful mechanical power; a heat generator ...

integrated with a carbon - neutral thermal energy source . [0002] Compressed air energy storage (CAES) systems store excess power available in an electrical grid during off - peak load periods and in turn supply electricity to the electrical grid during peak load periods . The CAES systems produce stored energy by compressing and storing a gas

A system and method for compressing and expanding air in a compressed air energy storage (CAES) system is disclosed. A CAES system is provided that is alternately operable in a compression mode and an expansion mode and includes therein a motor-generator unit and a drive shaft connected to the motor-generator unit that is configured to transmit rotational power ...

Compressed Air Energy Storage. In the first project of its kind, the Bonneville Power Administration teamed

with the Pacific Northwest National Laboratory and a full complement of industrial and utility partners to evaluate the technical and economic feasibility of developing compressed air energy storage (CAES) in the unique geologic setting of inland Washington ...

Among all energy storage systems, the compressed air energy storage (CAES) as mechanical energy storage has shown its unique eligibility in terms of clean storage medium, scalability, high lifetime, long discharge time, low self-discharge, high durability, and relatively low capital cost per unit of stored energy. In contrast, low roundtrip ...

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the stored energy is recovered and utilized for peak power generation by using the stored compressed air energy based on the most effective and optimized combination of the stored compressed air pressure and temperature. More particularly, during peak hours, compressed air is released from the air storage 36 at specific pressure and temperature and is routed through ...

(12) Patent Application Publication (10) Pub. No.: US 2011/0094212 A1 Ast et al. (43) Pub. Date: Apr. 28, 2011 (54) COMPRESSED AIR ENERGY STORAGE ... compressed air energy storage (CAES) system is alternately operable in a compression mode and an expansion mode and

The recent increase in the use of carbonless energy systems have resulted in the need for reliable energy storage due to the intermittent nature of renewables. Among the existing energy storage technologies, compressed-air energy storage (CAES) has significant potential to meet techno-economic requirements in different storage domains due to its long lifespan, ...

2.1 Fundamental principle. CAES is an energy storage technology based on gas turbine technology, which uses electricity to compress air and stores the high-pressure air in storage reservoir by means of underground salt cavern, underground mine, expired wells, or gas chamber during energy storage period, and releases the compressed air to drive turbine to ...

A hybrid compressed air/water energy storage system is described. The system includes a series of water containers and a plurality of inflatable bladders held within each container. An air compression facility is used to inflate the bladders upon which water is forced out of the containers to a water storage facility at a higher potential energy.

A hybrid compressed air energy storage system is provided. A heat exchanger 114 extracts thermal energy from a compressed air to generate a cooled compressed air stored in an air storage reservoir 120, e.g., a

cavern. A heat exchanger 124 transfers thermal energy generated by a carbon-neutral thermal energy source 130 to cooled compressed air conveyed from ...

A hybrid compressed air energy storage system is provided. A heat exchanger 114 extracts thermal energy from a compressed air to generate a cooled compressed air stored in an air storage reservoir 120, e.g., a cavern. A heat exchanger 124 transfers thermal energy stored in a thermal storage device 130 to compressed air conveyed from reservoir 120 to generate a ...

Abstract: A compressed air energy storage module including an integrated thermal energy storage and recovery apparatus is provided. The compressed air energy storage module contains no moving parts and is constructed onsite, underground and out-of-sight. The compressed air energy storage module comprises a first regenerative heat exchanger ...

The potential energy of compressed air represents a multi-application source of power. Historically employed to drive certain manufacturing or transportation systems, it became a source of vehicle propulsion in the late 19th century. During the second half of the 20th century, significant efforts were directed towards harnessing pressurized air for the storage of electrical ...

An example of energy storage potential is a large industrial complex. The complex may build a compressed air storage facility, install wind turbines that can provide energy at 3-4 ¢/kWh, and recharge the compressed air storage system with excess wind energy or with cheap, off-peak electrical energy in the middle of the night.

The method of energy storage is consistent with the concept proposed in the patent procedure [18]. 3. ... During the charging period of the energy storage system, compressed air is collected in an underground tank thanks to the use of a three-section compressor which uses intersection coolers. The total sum of the amount of energy used to power ...

@article{osti_863939, title = {Compressed air energy storage system}, author = {Ahrens, Frederick W and Kartsounes, George T}, abstractNote = {An internal combustion reciprocating engine is operable as a compressor during slack demand periods utilizing excess power from a power grid to charge air into an air storage reservoir and as an expander during peak demand ...

Citywide compressed air energy systems have been built since 1870. Cities such as Paris, Birmingham, Offenbach, Dresden in Germany and Buenos Aires in Argentina installed such systems. ... a compressed air storage system with an underground air storage cavern was patented by Stal Laval in 1949. Since that time, only two commercial plants have ...

@article{osti_1531902, title = {High-efficiency heat exchange in compressed-gas energy storage systems}, author = {Bollinger, Benjamin and Magari, Patrick and McBride, Troy O.}, abstractNote = {In various

embodiments, efficiency of energy storage and recovery systems employing compressed air and liquid heat exchange is improved via control of the system ...

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