

Large-scale compressed air energy storage



Overview

By storing vast amounts of energy in geological formations, depleted gas reservoirs, or even specially designed vessels, CAES systems can provide gigawatt-scale storage over extended durations—from hours to days or even months in certain contexts. This technology strategy assessment on compressed air energy storage (CAES), released as part of the Long-Duration Storage Shot, contains the findings from the Storage Innovations (SI) 2030 strategic initiative. The objective of SI 2030 is to develop specific and quantifiable research, development. As the world transitions to decarbonized energy systems, emerging long-duration energy storage technologies are crucial for supporting the large-scale deployment of renewable energy sources. In addition, the paper provides a comprehensive reference for planning and integrating different types of CAES into energy systems.

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Compressed-air energy storage

OverviewTypesCompressors and expandersStorageEnvironmental ImpactHistoryProjectsStorage thermodynamics

Compressed-air-energy storage (CAES) is a way to store energy for later use using compressed air. At a utility scale, energy generated during periods of low demand can be released during peak load periods. The first utility-scale CAES project was in the Huntorf power plant in Elsfleth, Germany, and is still operational as of 2024 . The Huntorf plant was initially developed as a loa...

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China achieves major breakthrough in compressed air energy storage

When electricity demand rises, the compressed air is released to drive turbines and generate power. Compared with conventional battery storage, CAES is valued for its long service life, large storage capacity, ...

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Compressed-air energy

storage

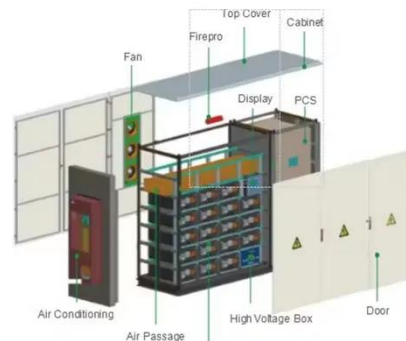


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Cost Reducing Adiabatic Compressed Air Energy Storage for Long ...

Schmidt et al. 10. McIntosh, with a large storage capacity of 2,640 MWh, shows particularly low unit costs. This demonstrates the benefit of CAES systems, where energy and power storage are decoupled, allowing for ...



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Compressed Air Energy Storage

Power-generation operators can use compressed air energy storage (CAES) technology for a reliable, cost-effective, and long-duration energy storage solution at grid scale.

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Comprehensive Review of Compressed Air Energy Storage (CAES)

This paper provides a comprehensive review of CAES concepts and compressed air storage (CAS) options, indicating their individual strengths and weaknesses. In addition, the paper provides a ...

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Technology Strategy Assessment

This technology strategy assessment on compressed air energy storage (CAES), released as part of the Long-Duration Storage Shot, contains the findings from the Storage Innovations (SI) 2030 strategic initiative.

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Compressed Air Energy Storage (CAES): A Comprehensive 2025 Overview

Compressed Air Energy Storage (CAES) has emerged as one of the most promising large-scale energy storage technologies for balancing electricity supply and demand in modern power grids.

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Advanced Compressed Air Energy Storage Systems:

Fundamentals and

The "Energy Storage Grand Challenge" prepared by the United States Department of Energy (DOE) reports that among all energy storage technologies, compressed air energy storage (CAES) offers the ...

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China Scales Up Compressed Air Energy Storage

China has developed a compressed air energy storage compressor exceeding 100 megawatts of single-unit power, a scale that begins to address one of the core constraints of CAES deployment.

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A comprehensive review of compressed air energy storage technologies

It reveals that CAES projects are evolving toward larger scales, higher efficiency, and more environmentally friendly practices. The future trends in CAES are analyzed, focusing on potential efficiency ...

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