



# Efficiency and cost of compressed air energy storage





## Overview

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Compression of air creates heat; the air is warmer after compression. Expansion removes heat. If no extra heat is added, the air will be much colder after expansion. If the heat generated during compression can be stored and used during expansion, then the efficiency of the storage improves considerably. There are several ways in which a CAES system can deal with heat. Air storage can be , diabatic, , or near-isothermal.

Compressed Air Energy Storage costs 26c/kWh as a storage spread to generate a 10% IRR at a \$1,350/kW CAES facility, with 63% efficiency.

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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. [1] The first utility-scale CAES project was in the Huntorf power plant in Elsfleth, Germany.

Our base case for Compressed Air Energy Storage costs require a 26c/kWh storage spread to generate a 10% IRR at a \$1,350/kW CAES facility, with 63% round-trip efficiency, charging and discharging 365 days per year. Our numbers are based on top-down project data and bottom up calculations, both for.



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### Compressed-air energy storage

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### [Compressed Air Energy Storage Costs?](#)

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### [Lifetime Cost Analysis of Compressed Air Energy Storage ...](#)

Compressed air energy storage (CAES) technology has significant advantages such as large storage capacity, high efficiency, long lifetime, easy maintenance, and short construction ...

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### [A comprehensive review of compressed air energy storage ...](#)

An economic analysis using the levelized cost of storage (LCOS) indicates that the LCOS for large-scale CAES is only marginally higher than that of pumped hydro storage, ...



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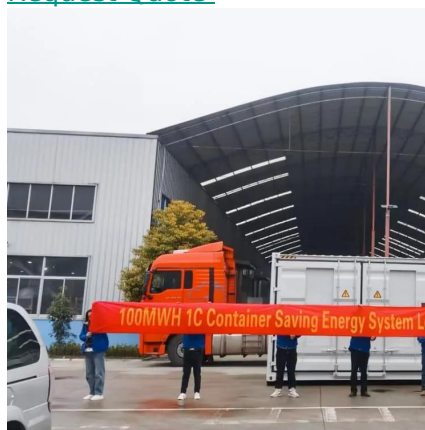


## Compressed-air energy storage

OverviewTypesCompressors and expandersStorageEnvironmental ImpactHistoryProjectsStorage thermodynamics

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## [How does the cost of compressed air storage ...](#)

In summary, compressed air storage offers a competitive cost position relative to other long-duration energy storage technologies, being ...

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## [Compressed Air Energy Storage: How It Works](#)

CAES offers substantial benefits, including a significantly lower environmental impact compared to conventional fossil fuel-based energy



systems. Its ability for large-scale ...

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### [Compressed Air Energy Storage \(CAES\): A Comprehensive 2025 ...](#)

While the technology's round-trip efficiency traditionally lags behind that of batteries, ongoing research--especially in adiabatic CAES (A-CAES)--has substantially ...

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### [Comprehensive Review of Compressed Air Energy Storage ...](#)

As a mechanical energy storage system, CAES has demonstrated its clear potential amongst all energy storage systems in terms of clean storage medium, high lifetime ...

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### **How does the cost of compressed air storage compare to other ...**

In summary, compressed air storage offers a competitive cost position relative to other long-duration energy storage technologies, being cheaper than lithium-ion batteries for ...

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## **Technology Strategy Assessment**



During discharge, the compressed air is run through a turboexpander to generate electricity back to the grid.

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## A comprehensive performance comparison between compressed air energy

Compared to compressed air energy storage system, compressed carbon dioxide energy storage system has 9.55 % higher round-trip efficiency, 16.55 % higher cost, and 6 % ...

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