



# Cost-effectiveness of low-pressure energy storage containers





## Overview

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MIT and NTNU research shows liquid air energy storage (LAES) offers a cost-effective, efficient solution for long-duration grid storage. With competitive LCOS and reliable performance, LAES could outperform batteries and pumped hydro for a decarbonized power network.

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The Energy Storage Grand Challenge (ESGC) is a crosscutting effort managed by the Department of Energy's Research Technology Investment Committee. The project team would like to acknowledge the support, guidance, and management of Paul Spitsen from the DOE Office of Strategic Analysis, ESGC Policy.

NREL is a national laboratory of the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy Operated by the Alliance for Sustainable Energy, LLC This report is available at no cost from the National Renewable Energy Laboratory (NREL) at Contract No.

Compressed Air Storage: BloombergNEF data shows an average capex of around \$293/kWh for compressed air storage systems targeted at long durations (8 hours or more). This figure is for global averages, with variation depending on location and technology maturity. Thermal Energy Storage: Thermal.

Researchers from MIT and Norwegian University of Science and Technology (NTNU) find that liquid air energy storage (LAES) represents a promising solution for long-duration storage in grid environments on a decarbonised power network. The power grid depends on reliable and economical energy storage.

MODELLING by chemical engineers in the US and Norway suggests that liquid air energy storage (LAES) could be a more cost-effective option than existing techniques. Researchers at MIT and the Norwegian University of Science and Technology found it could be considerably cheaper than lithium-ion.

Long-duration energy storage (LDES) is a vital part of a clean energy future, storing



renewable energy for periods up to 100 hours. These technologies come with varying price tags. Levelized cost of storage (LCOS, the cost per unit of energy delivered) is a measure of LDES technologies cost. What is compressed air energy storage?

Compressed air energy storage (CAES) is one of the many energy storage options that can store electric energy in the form of potential energy (compressed air) and can be deployed near central power plants or distribution centers. In response to demand, the stored energy can be discharged by expanding the stored air with a turboexpander generator.

What are the different types of energy storage costs?

The cost categories used in the report extend across all energy storage technologies to allow ease of data comparison. Direct costs correspond to equipment capital and installation, while indirect costs include EPC fee and project development, which include permitting, preliminary engineering design, and the owner's engineer and financing costs.

Which energy storage technologies are included in the 2020 cost and performance assessment?

The 2020 Cost and Performance Assessment provided installed costs for six energy storage technologies: lithium-ion (Li-ion) batteries, lead-acid batteries, vanadium redox flow batteries, pumped storage hydro, compressed-air energy storage, and hydrogen energy storage.

How much does energy storage cost?

A notable part of the study is the analysis of the "levelized cost of storage" (LCOS), which measures the cost of storing energy over a system's lifetime. The findings indicate an LCOS of approximately \$60 per megawatt-hour for LAES.



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### Choosing the Right Energy Storage Technology: A Cost-Effective ...

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### [Optimizing Industrial Compressed Air Energy Storage ...](#)

CAES, MTA-CAES, HTA-CAES) -- are scrutinized via exergoeconomic. The outcomes highlighted the exergetic. production at 0.076 \$/kWh and 0.075 \$/kWh, respectively. ...



### A comprehensive Thermoeconomic assessment of liquid air and ...

Present study undertakes a comprehensive thermoeconomic evaluation of Liquid Air Energy Storage (LAES) and Compressed Air Energy Storage (CAES), with a focus on cost ...



### [Liquid Air Energy Storage Emerges as a Viable ...](#)

MIT and NTNU research shows liquid air energy storage (LAES) offers a cost-effective, efficient solution for long-duration grid ...



### 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 ...

### Economic Long-Duration Electricity Storage by Using Low ...

Economic Long-Duration Electricity Storage by Using Low-Cost Thermal Energy Storage and High-Efficiency Power Cycle (ENDURING) NREL is a national laboratory of the ...



### 2022 Grid Energy Storage Technology Cost and ...

Foundational to these efforts is the need to fully understand the current cost structure of energy storage technologies and identify the research and development opportunities that can impact ...





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## **Liquid air could be cheapest method for long-term energy storage**

Researchers at MIT and the Norwegian University of Science and Technology found it could be considerably cheaper than lithium-ion batteries and pumped hydropower. ...

## 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 ...



## Optimizing Industrial Compressed Air Energy ...

CAES, MTA-CAES, HTA-CAES) -- are scrutinized via exergoeconomic. The outcomes highlighted the exergetic. production at ...



## Technology Strategy Assessment

Some of the challenges of this technology include high upfront capital costs, the need for heat during the expansion step, lower round-trip efficiency (RTE), siting and permitting challenges, ...



### [Liquid air could be cheapest method for long-term ...](#)

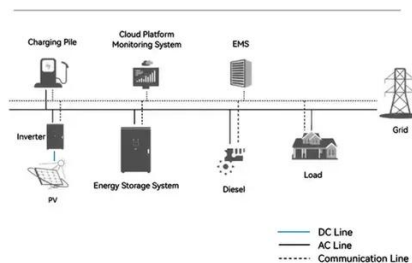
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### [Comprehensive Review of Compressed Air Energy ...](#)

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#### System Topology



### **Liquid Air Energy Storage Emerges as a Viable Low-Cost Option ...**

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