

Compressed Air Energy Storage (CAES) Solutions

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Subsurface storage of media like natural gas in caverns is widely used today. Many caverns are available in the area of the North Sea including its neighboring countries. In light of the of the political pledge to even stronger increase the addition of new renewable energy like wind power and photovoltaic from most recent level, the need for appropriate long duration energy storage (LEDS) is becoming more and more important.

Compressed Air Energy Storage solution can easily be deployed building on existing subsurface storages or even repurposing existing gas pipelines as storages. With mature and proven components this represents a low risk, high impact, readily available solution. So honestly, we have to talk about Compressed Air Energy Storage!



Compressed Air Energy Storage is already known since the 1970ies when the first plant has been built in Huntorf / Germany. A second plant has been built in the early 1990ies in McIntosh / Alabama, USA. Only most recently a new build plant has been commissioned in China. In the Western hemisphere we recognize a strong and increasing interest in this solution, with the first projects to potentially enter operation as early as 2026/27.

There are two different variants of Compressed Air Energy Storage solutions. The first is the already known (diabatic) version as it can be seen in Huntorf or McIntosh. Air from environment is compressed by means of several compressors and stored in an underground salt cavern. When favorable, the air is released thru an expander consisting of a HP Air Expander and a modified LP Gas Turbine Expander. The LP Gas Turbine Expander is required to heat up the air before expansion to avoid damages to the expander train.

As the above version, due to its nature using natural gas, is subject to emissions like CO₂ and NO_x, a second (adiabatic) version is readily developed: the heat that is produced during

compression will be stored in a separate heat storage. While expanding the stored heat will be used to reheat the air. Subsequently this will constitute a 100% emission free solution.

Siemens Energy is in a unique position to offer both of the aforementioned variants of Compressed Air Energy Storage solutions comprising proprietary equipment. For the diabatic version we are on track of soon using 100% H₂. In addition, we are looking into different type of storages for the adiabatic version, e.g. pipeline storage as well as hybrid models combining adiabatic and diabatic expansion.