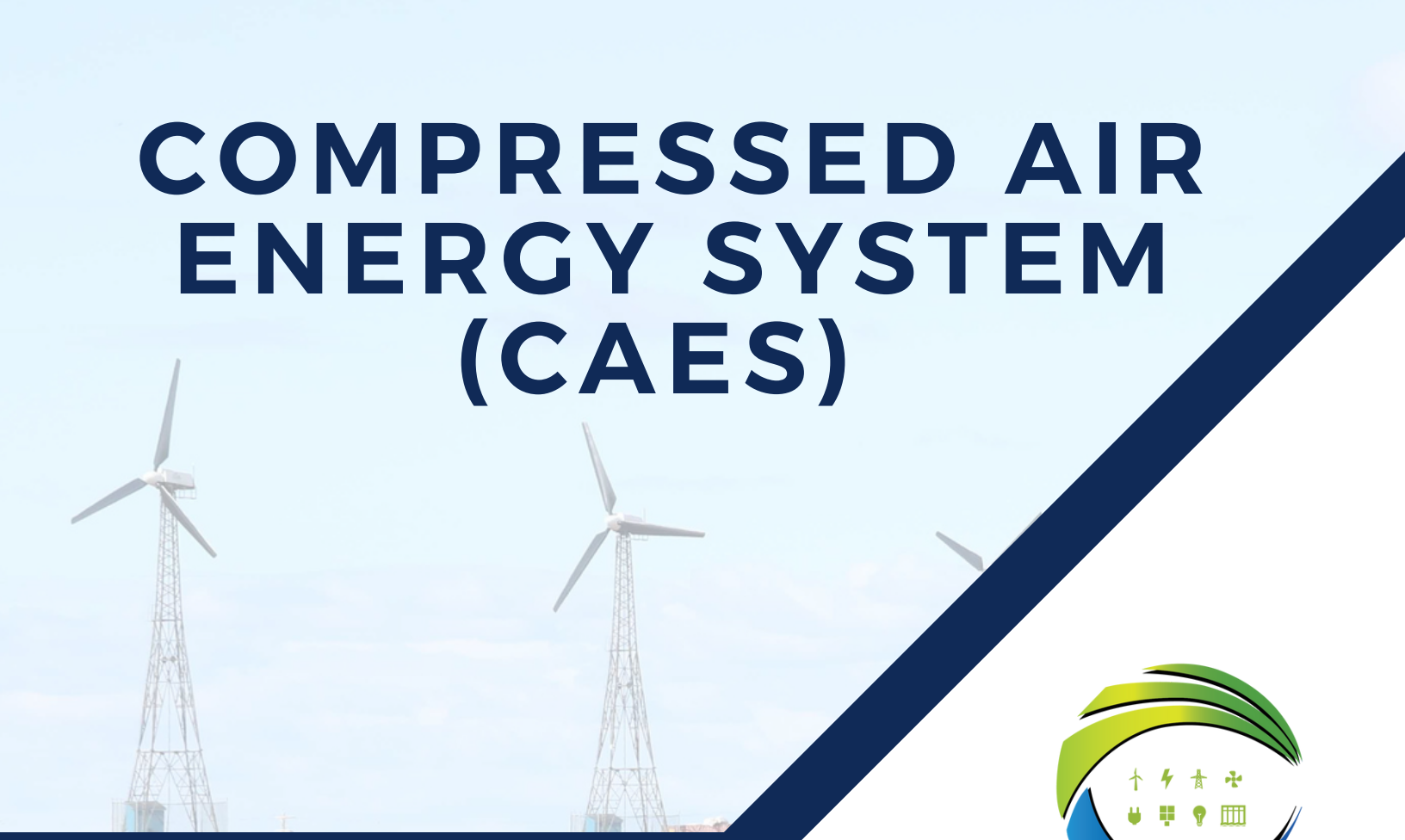
COMPRESSED AIR ENERGY SYSTEM (CAES)



CASES

FACT SHEET

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What is a Compressed Air Energy System (CAES)?

When we think of harnessing the power of air to generate electricity, we often think of wind power. Although free and relatively easy to transform into energy, the limitations of wind are also evident. The sky might be still when we need power or be blowing steadily while we sleep, which leads to an abundance of potential energy going unused. For the past half century, a little known technology called compressed air energy system (CAES) has captured the power of air to provide long-term on-demand power.

CAES produces electricity in a similar manner to wind. Air pressure spins a turbine that converts kinetic energy to electricity. However, instead of capturing the power from wind, compressed air is forced into a cavern where it can be stored for long periods of time. The amount of power than can be stored depends on the size of the cavern, offering the potential for serving seasonal energy needs.

What Are CAES Used For?

There are currently two CAES power plants in operation. The Huntorf Plant in Germany was constructed in 1978 in 600m deep airtight salt caverns that have a capacity of 310,000m3. At peak output, it can provide 290MW for 2 hours and has a daily charging cycle of 8 hours.[1]

[1] Kendall Mongird, et al., 2020, “Grid Energy Storage Technology Cost and Performance,” U.S. Department of Energy, December 2020, Publication No. DOE/PA-0204, 37.

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The second—the McIntosh Power Plant—was built in 1991 in Alabama. The plant is located in a salt cavern located 1,500 feet below ground and has 19.8 million cubic feet of compressed air storage. It has an output capacity of 226 MW.[2]

The Huntorf Plant is divided into two chambers with separate functions. The first serves as a backup energy source for a nearby nuclear power plant. The second chamber provides power during peak hours and is recharged on a daily basis. Since the plant uses deep salt caverns, the air pressure can be stored for periods of many months without unintended loss of energy and to be charged and discharged daily without impacting the durability of the chambers.

Both the Huntorf Plant and the McIntosh Plant use gas-powered electricity to operate the air compression system.

CAES and Renewable Energy

There has been a renewed interest in recent years in the use of CAES in combination with renewable energy. In geologically suitable locations where there are large underground caverns, CAES can serve as low cost, long-term and large-scale energy storage. In the absence of large caverns, smaller scale CAES plants could potentially utilize above ground steel storage tanks.[3]

[2] Ibid, 37.
[3] Paul Breeze, 2019, “Power System Energy Storage Technologies,” in Power Generation Technologies (Third Edition), Oxford, UK: Elsevier Ltd., 230-231.

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