Efficiency of Compressed Air Energy Storage - DTU Orbit (10/11/2019)

Efficiency of Compressed Air Energy Storage
The simplest type of a Compressed Air Energy Storage (CAES) facility would be an adiabatic process consisting only of a compressor, a storage and a turbine, compressing air into a container when storing and expanding when producing. This type of CAES would be adiabatic and would if the machines were reversible have a storage efficiency of 100%. However, due to the specific capacity of the storage and the construction materials the air is cooled during and after compression in practice, making the CAES process diabatic. The cooling involves exergy losses and thus lowers the efficiency of the storage significantly. The efficiency of CAES as an electricity storage may be defined in several ways, we discuss these and find that the exergetic efficiency of compression, storage and production together determine the efficiency of CAES. In the paper we find that the efficiency of the practical CAES electricity storage is 25-45% and thus has a quite low efficiency, which is close to the efficiency of the simple diabatic CAES-process. Adiabatic CAES would reach significantly higher storage efficiency about 70-80%.

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