

How efficient are energy storage systems?

The maximum roundtrip efficiency of the improved energy storage system is 69.38%. Recuperator loss accounts for the largest proportion of total exergy loss, 35-65%. Pumped thermal electricity storage systems are a potential approach to large-scale energy storage, and supercritical carbon dioxide (SCO 2) is a promising working fluid.

Does heat transfer match SCO 2 with storage medium and recuperator performance?

The maximum portion of exergy was destroyed in the heat exchangers between SCO 2 and the storage medium in the nonrecuperative system, and in the recuperators in the recuperative systems. Therefore, improving the heat transfer matching of SCO 2 with the storage medium and recuperator performance is the key to increasing efficiency.

How does the HTE outlet SCO 2 work?

The HTE outlet SCO 2 enters the TUR for expansion to produce power. Subsequently, the working fluid from the TUR is sent to the LTE to transfer part of the medium-low temperature heat to the storage medium as shown in Fig. 2 (b).

What is SCO 2 cycle?

The COMP inlet parameters of the SCO 2 cycle are near the critical point, which significantly reduces compression power and enhances cycle efficiency. The high density of SCO 2 enables high power density and compact turbomachinery and heat exchanger equipment.

Which material should be used for SCO 2 components?

For these reasons, for the components of the sCO 2 system operating at high temperature (i.e. turbine and primary heater) the most suitable material candidates are nickel rich alloys [79,80], while stainless steel can be used for components withstanding lower temperatures (i.e. recuperators operating below 500 °C).

What is the simplest configuration of a SCO 2 power cycle?

The simplest configuration of a sCO 2 power cycle is the simple regenerated layout presented in Fig. 3. This system is composed of three heat exchangers and two turbomachines, namely compressor and turbine.

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At first glance capacitor storage systems seem to offer best performance. However, an in-depth analysis reveals that a flywheel storage system gives better results for the given application, ...

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