

# Laos cryogenic energy storage device agent

What is cryogenic energy storage?

Cryogenic energy storage (CES) is the use of low temperature (cryogenic) liquids such as liquid air or liquid nitrogen to store energy. The technology is primarily used for the large-scale storage of electricity.

Who invented cryogenic energy storage?

The idea of cryogenic energy storage was firstly proposed by E.M Smith, at university of New Castle in 1977 (Smith,1977), and tested by Mitsubishi in 1998 (Kishimoto et al.,1998; Sciacovelli et al.,2017) using liquid air as cryogen.

What is a cryogen liquefied gas?

A cryogen is a liquefied gas that boils at a temperature below  $-150\text{ }^{\circ}\text{C}$  (Li et al.,2010a). According to Li et al. (2010a), the energy stored in the cryogen is different from other heat storage : the energy stored in the cryogen is obtained from decreasing its internal energy and increasing its exergy.

Is air a cryogenic energy storage medium?

Air has been recently regarded as a Cryogenic Energy Storage (CES) medium, whereby air is liquefied at around  $-195\text{ }^{\circ}\text{C}$  and stored in insulated tanks (Antonelli et al.,2017). This technology is called Liquid Air Energy Storage (LAES).

Where can a cryogenic energy storage plant be located?

Unlike other grid-scale energy storage technologies which require specific geographies such as mountain reservoirs (pumped-storage hydropower) or underground salt caverns (compressed-air energy storage), a cryogenic energy storage plant can be located just about anywhere.

Which energy recovery methods are used in cryogen liquefaction?

Linde-Hampson, Claude and Solvay cycles were mentioned in previous works to be the most appropriate for cryogen liquefaction. Super-heating and combustion methods combined to direct expansion are the most popular energy recovery methods in studies related to CES or LAES.



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