

## European Solar Energy Storage

# Danish inter-seasonal energy storage



## Overview

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Seasonal thermal energy storage (STES), also known as inter-seasonal thermal energy storage, is the storage of heat or cold for periods of up to several months. The thermal energy can be collected whenever it is available and be used whenever needed, such as in the opposing season. For example, heat from solar collectors or from air conditioning equipment can be gathered in hot months for space heating use when needed, including during winter months.

## Danish inter-seasonal energy storage

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### Danish Solar Thermal Energy Storage: Heating the Future, One ...

But Danish solar thermal energy storage is quietly rewriting the rulebook on how we harness sunlight for heat. Imagine a world where summer sunshine heats your shower in December - that's exactly what Danish engineers are achieving through seasonal thermal energy storage (STES) systems [1].

### danish inter-seasonal energy storage

Meeting inter-seasonal fluctuations in electricity production or demand in a system dominated by renewable energy requires the cheap, reliable and accessible storage of energy on a scale that is currently challenging to achieve.



### Seasonal storage through Power-to-X --the key to a robust energy ...

When we phase out fossil fuels, we will in Denmark need a terawatt-hour-sized energy storage solution to get through the winter. The capacity of terawatt hours (TWh) equals millions of car batteries, so it's not something we can solve using standard batteries.

## Design and Construction of Large Scale Heat Storages for ...

This publication focuses on sensible seasonal heat storages, especially borehole thermal energy storages (BTES) and pit thermal energy storages (PTES) in applications with solar thermal systems.



### Seasonal thermal energy storage

Seasonal thermal energy storage (STES), also known as inter-seasonal thermal energy storage, [1] is the storage of heat or cold for periods of up to several months.

## Solar district heating with the largest pit thermal storage globally

The small Danish town of Vojens, home to 7,480 people and known for its less sunny climate, hosts the world's largest seasonal solar heat storage project in operation since 2016.



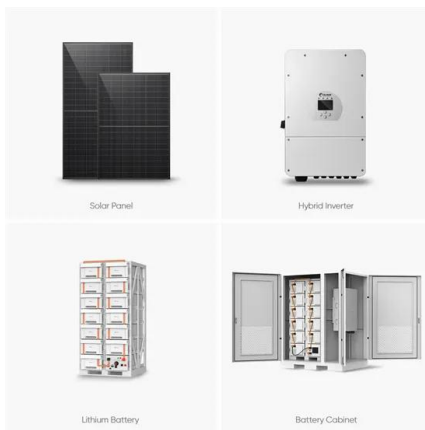
## LONG TERM STORAGE AND SOLAR DISTRICT HEATING

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or waste heat from air conditioning equipment can be gathered in hot months for space heating use when needed, including during winter months. ...

## Seasonal heat storage

Status and recommendations for RD& D on energy storage technologies in a Danish context (2014). Edited by Alan Schrøder Pedersen, DTU and prepared for the Danish energy research programmes



## Seasonal storage through Power-to-X --the key to a ...

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## LONG TERM STORAGE AND SOLAR DISTRICT HEATING

In Denmark the need for electricity is bigger in the winter where the hours of sunshine are limited. Therefore, storing the energy from summer to winter is the next step towards a more flexible electricity and heat production and higher fraction of solar thermal energy.



## Danish inter-seasonal energy storage kroner



Other unique features of the Danish district heating sector include large-scale collective heat planning, the mandatory connection, the non-profit principle, the same approximate price for customers irrespective of heat density, and the relatively high average price of district heating.

## Energy Storage Should be a Danish Stronghold.

"We need to make storage a Danish strength, and it requires that the energy industry, industrial sector, consultants, suppliers, and researchers work purposefully together to develop future storage solutions."



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