



Status of the Danish Pit Thermal Energy Storage (PTES) solution

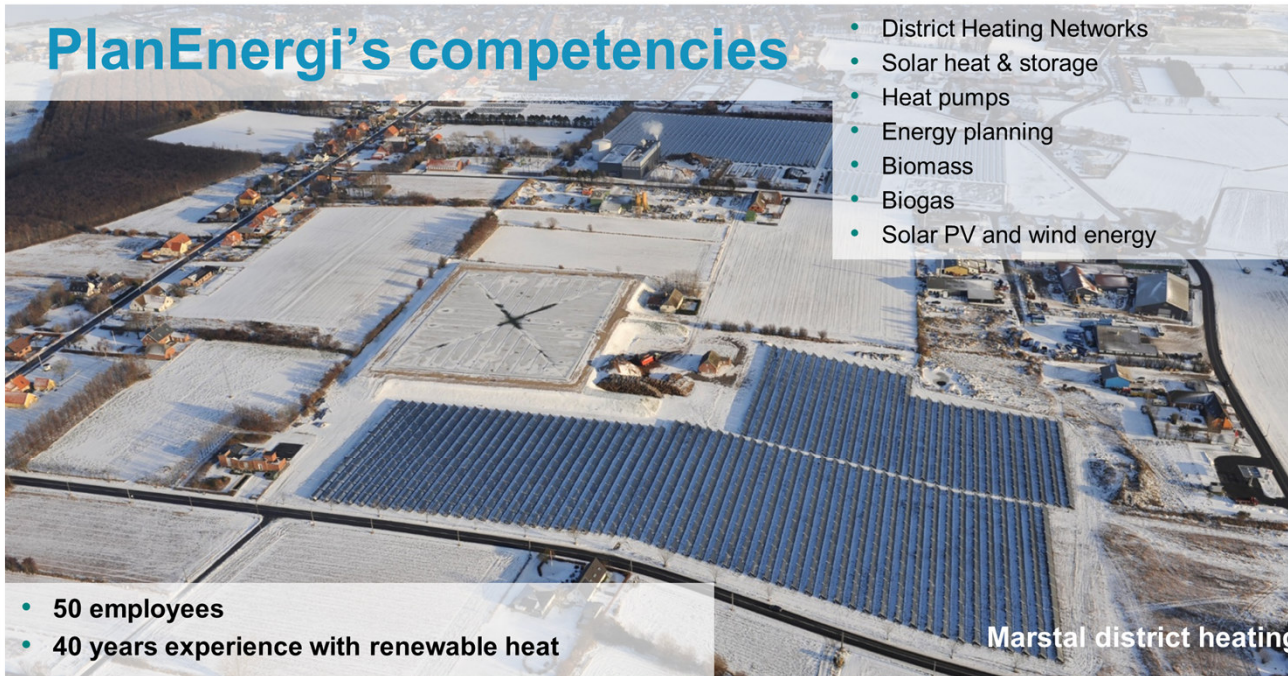
Per Alex Sørensen, PlanEnergi

Large Scale TES webinar

12.12.2024

PlanEnergi's competencies

- District Heating Networks
- Solar heat & storage
- Heat pumps
- Energy planning
- Biomass
- Biogas
- Solar PV and wind energy



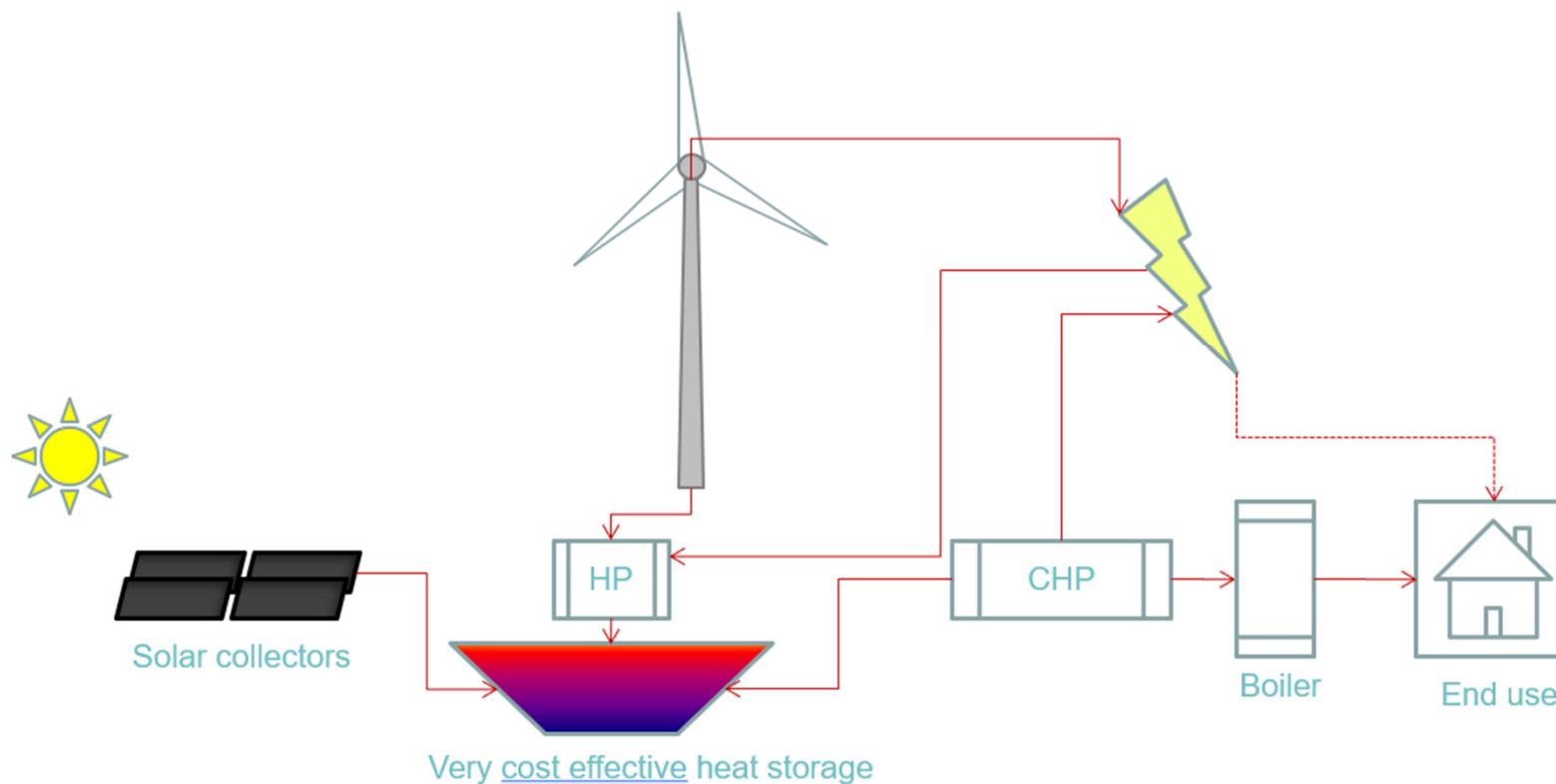
Realised PTES

Country	Project	Size	Heat capacity	Year commissioned
DK	DTU	500 m ³		1983
DK	Ottrupgaard	1'500 m ³	43.5 MWh	1995
DK	Marstal Sunstore 2	10'000 m ³	638 MWh	2003
DK	Marstal Sunstore 4	75'000 m ³	6'960 MWh	2012
DK	Dronninglund	60'000 m ³	5'500 MWh	2013
DK	Gram	122'000 m ³	11'300 MWh	2014
DK	Vojens	203'000 m ³	18'800 MWh	2015
DK	Toftlund	85'000 m ³	6'500 MWh	2017
CN	Tibet	15'000 m ³	1'000 MWh	2018
DK	Høje-Taastrup	70'000 m ³	3'300 MWh	2023

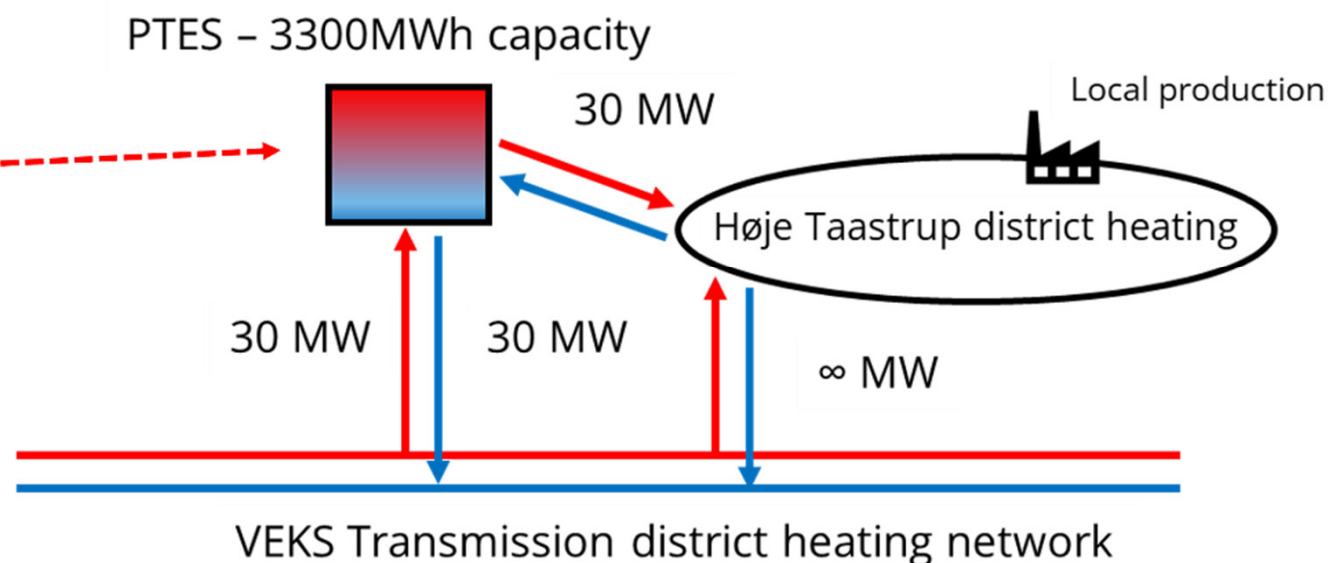
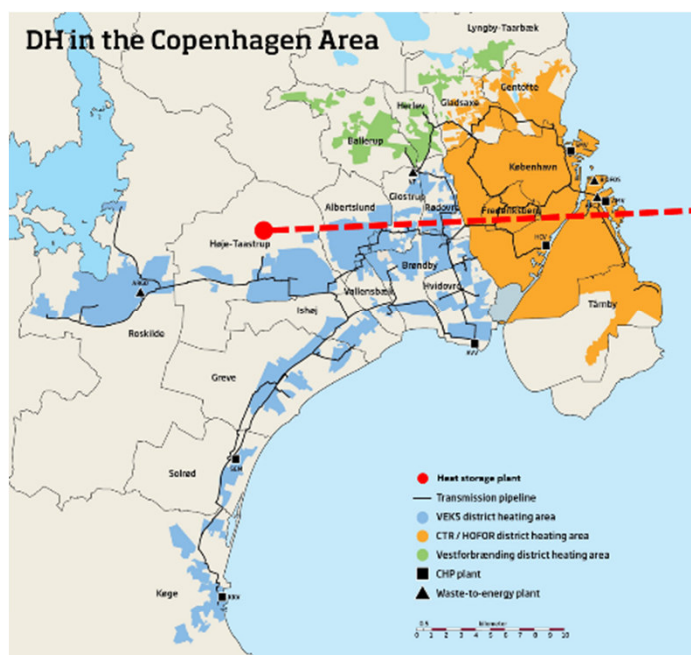


Solar thermal was the basis for PTES

The SUNSTORE[®] concept can integrate renewable electricity in heat production.



Høje Taastrup – Waste heat as basis and 90 °C constantly



The heat storage plant is connected to VEKS' transmission line with a maximum heat transfer of 30MW as charge of the storage and a corresponding discharge of 30MW to the distribution network of Høje Taastrup District Heating

The heat storage plant receives heat from the transmission system (~ 95-110°C)

The heat storage plant delivers heat to the distribution network at Høje Taastrup (~ 75°C)

What was new in Høje Taastrup?

Calculated income: 1.05 mio. €/year

50% from better electricity prices

25% from peak shaving

25% from more efficient use of fuel

CO₂ saved: 6,200 t/y

3,200 t/y from the electricity sector

3,000 t/y from peak shaving (natural gas)



New PP-liner from AGRU. Tested at JKU Linz. Expected lifetime >40 years

Ongoing test at Danish Technological Institute

Better version of insulation from Termonova. Ongoing test at JKU Linz

Previous roles for low-temperature heat storage for district heating

Storage for solar heating (adds flexibility in relation to variable solar radiation)

Storage for surplus heat from e.g. waste incineration

Storage for cogeneration (adds flexibility in relation to the electricity market)

Storage for heat from heat pumps

Storage for electric boilers (adds flexibility in relation to the electricity market)

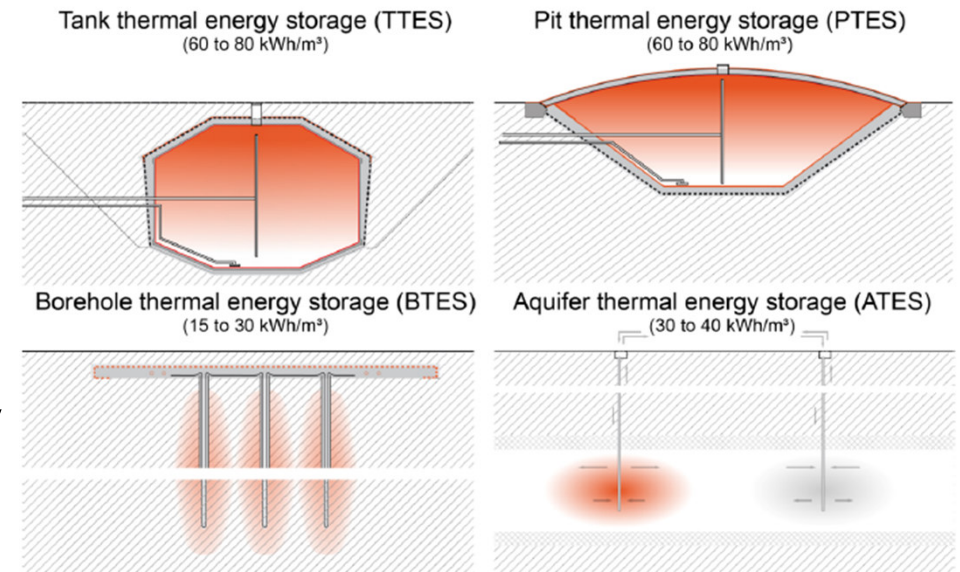


Figure 1: Overview of available underground thermal energy storage concepts (Solites)

In our pipeline (beside projects in Treasure)

Fjernvarme Fyn, Odense DK

700,000 m³

Heat from biomass CHP, heat pumps, waste heat

Solar4Kosovo, Pristina, Kosovo. Subcontractor to CES (Wien)

380,000 m³

Heat from solar thermal, absorption heat pump

Hjørring, DK. Subcontractor to Niras (DK)

400,000 m³

Heat from waste, heat pumps, PtX, fish production

Other projects.....

Possible new future roles for low-temperature heat storage for district heating

Long-term heat storage of heat from PtX plants (Production of hydrogen, methanol, ammonia)

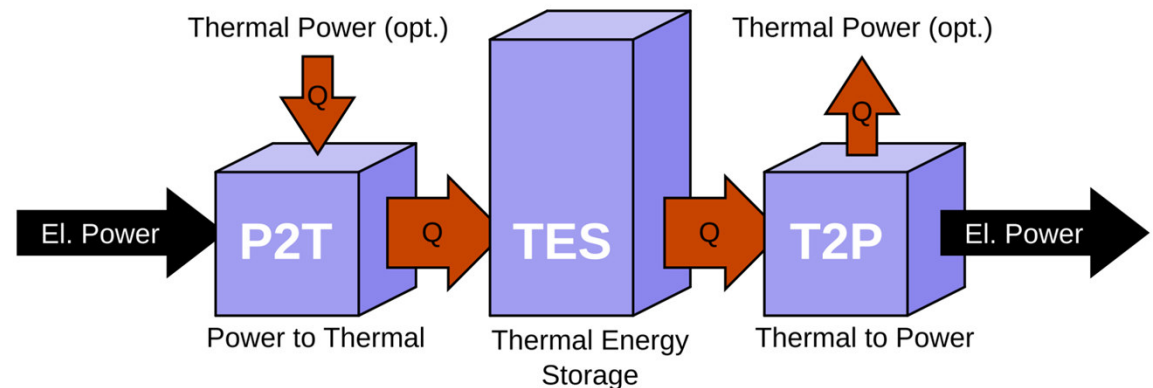
Long-term heat storage of geothermal heat

Long-term heat storage of cheap summer heat from heat pumps (e.g. from data centers, cold stores, compressors..)

Reduction of peak load in district heating systems in winter and replacement of fossil peak load

As a cold storage and supplier of district cooling (if there is a heat pump connected to the storage)

As a heat source for a Carnot Battery.



WEBSITE

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Thank you
for your attention!

Contact us if you have any questions.



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