

6.8MW_{TH} SOLAR DISTRICT HEATING PLANT

for Taars Varmeværk, Denmark





FROM IDEA to reality



Autumn 2014
Contract for the solar district heating plant



Winter 2014
First digging - civil work begins



Spring 2015
Solar field construction begins



Summer 2015
Solar heating plant goes operational

CSP combined with FLAT PANELS

PROJECT FACTS

CUSTOMER NEED
Solar heat up to 98 °C

COMBINATION PLANT

4,039 m² CSP parabolic troughs

5,972 m² flat panels

6,082 MWh heat / year

up to 31% solar energy share

END USERS
840 customers

SAVINGS
15% savings / customer

23,000 tons CO₂ / year

In August 2015, the world's first solar district heating system went into operation in the northern part of Denmark, in the municipality of Taars. The system is globally-unique as it combines the concentrated solar power (CSP) technology with flat panels to supply around 850 households as well as some minor industries with sustainable heating.

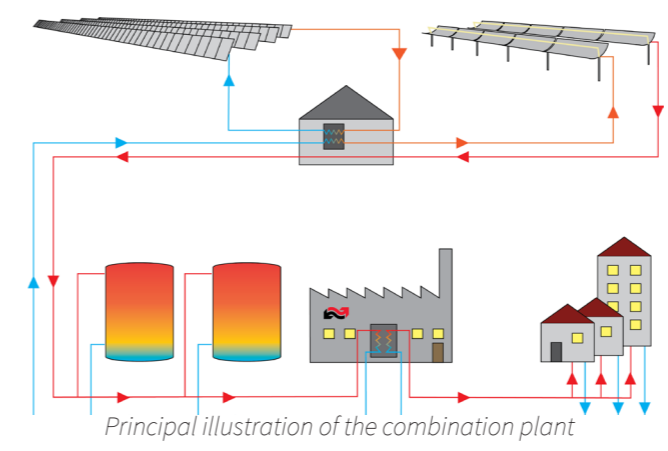
The system consist of a 4,039 m² CSP parabolic trough system and a 5,972 m² flat panel field to generate 6,082 MWh annually.

The combination of these two solar-thermal technologies is an optimal match as both systems deliver what they do best: flat collectors have a higher performance at lower temperatures and produce more heat around midday, whereas CSP is most efficient at higher temperatures and provides a more balanced heat production throughout the day. This mix therefore allows better daily energy distribution and the highest possible - up to 31% - solar energy share, without the use of seasonal storage.

"Supplementing flat solar collectors with the CSP technology is similar to adding a turbo to an engine. It may slightly increase the investment costs, but as the yield of energy is maximized, the overall economy significantly improves" - explains Per Asted, Sales & Project Engineer at Aalborg CSP.

Besides maximizing heat production, the most advanced solar district heating system in Denmark also achieves 15% price reduction for the end users.

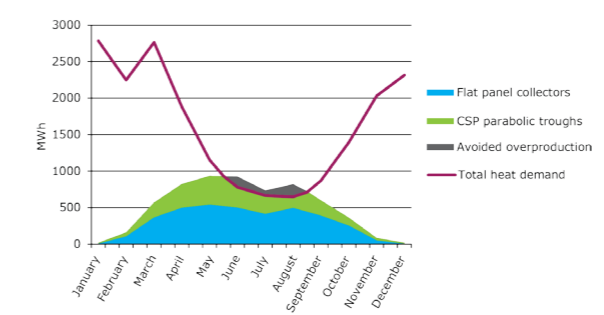
Harvesting the sun IN THE MOST EFFICIENT WAY



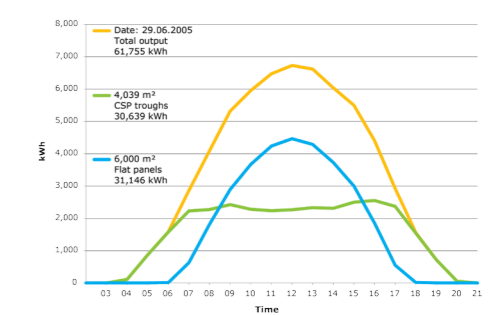
Normally, the maximum utilization of flat panel systems without seasonal storage lies around 20%. By combining two solar-thermal technologies a production of 6,082 MWh is achieved covering up to 31% of the city's heat demand.

This is the largest solar energy share achieved compared to a conventional plant consisting of flat panels only. Even if the cost per m² of CSP is higher, it shows cost-effectiveness and the overall system is cost-competitive to present natural gas boiler heat production costs.

The 31% solar energy share is also supported by the fact, that the CSP troughs can be defocused when the energy storage is full, in contrast to flat panels that always deliver heat when the sun is shining.



Solar energy output projection based on DMI DRY 2012 weather data



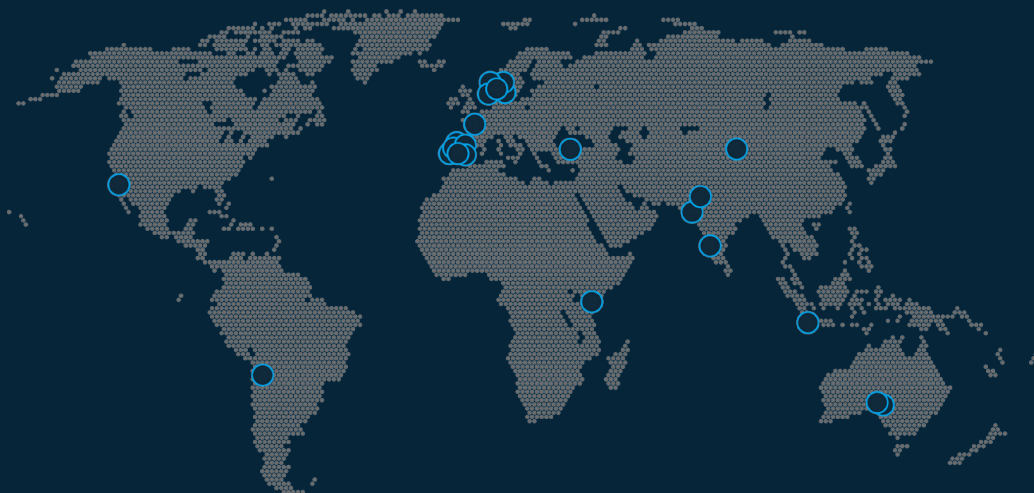
Energy production throughout the day

CHANGING ENERGY *around the world*

Aalborg CSP is a leading developer and supplier of innovative renewable technologies aiming to change the way energy is produced today. Relying on extensive experience from some of the most efficient concentrated solar power (CSP) projects around the world, the company designs and delivers green technologies and integrated energy systems to lower the cost of energy for industries and power plants worldwide.

Aalborg CSP places strong focus on R&D activities and partners with knowledge-based companies and institutions to create leading-edge technologies. As a result, the Aalborg CSP engineering design is centred on a value-adding concept providing solutions that excel in operation, increase plant revenue and contribute to a greener future.

Headquartered in Aalborg (Denmark) and with sales & service offices in Spain, the US, Australia and Indonesia, Aalborg CSP has realised more than 1,700MWth cost effective green energy solutions to a variety of industries worldwide.



5 sales & service locations
more than 1,700 MWth solar installations

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