



SOLAR DISTRICT HEATING SYSTEMS

**Harvesting the sun in the most efficient way
to lower energy costs of district heating**



Svante Bundgaard,
CEO of Aalborg CSP

“ We harvest the sun in the most efficient way to lower energy costs of district heating. ”

With a global leadership in concentrated solar power (CSP) systems and technologies, Aalborg CSP was the first company to bring the CSP technology - that is typically used in sunny desert areas - to Denmark.



In order to achieve highest efficiency in the colder European climate, the solar-thermal technology has been continuously optimized contributing to an award-winning design that maximizes yield of energy for hot water production as well as combined heat and power generation. The solution received the “Greenest district heating solution of the year” award in 2012.

Knowledge forms the basis of Aalborg CSP’s activities and supports the company to achieve its mission towards designing and delivering renewable energy systems that lower 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 solar district heating systems are all state-of-the-art solutions with a value-adding engineering design providing solutions that excel in operation, increase plant revenue and contribute to a greener future:

Operational excellence

We utilize best practices and tested concepts to ensure that our technologies deliver on promises and reliably operate with low maintenance requirements. Our performance track records confidently prove that solutions delivered by Aalborg CSP are guaranteed to perform as expected.

Increasing plant revenue

It is a fundamental principle in our engineering design to lower cost of energy for the district heating market. With world-class thermal engineering expertise we aim to unlock the black-box to create projects in areas where otherwise it would not be possible.

Contributing to a greener future

With a vision to change the way we produce energy today, our aim is to design solutions that will accelerate the world’s renewable energy transition. We do that by continuous product development in order to make more competitive solar district heating systems.

IDENTIFYING CUSTOMER NEEDS

- Optimised solution for the best price based on individual client needs
- Specifying project requirements - from design to system construction

PROJECT DEVELOPMENT

- Close collaboration with the customer and the advisors
- Support in regulatory approvals
- Material and supplier selection

PRICE QUOTE PRESENTATION

- Fixed price and delivery time
- Presentation for stakeholders

PROJECT MANAGEMENT

- Setting up the solar plant
- Pipework
- Integration
- SRO - Control, Regulation and Monitoring
- Start-up, Commissioning and Testing
- Training in operation
- Operation and maintenance plan

SOLAR DISTRICT HEATING TECHNOLOGIES

- INNOVATIVE SOLUTIONS FOR THE PRODUCTION OF DISTRICT HEATING



CONCENTRATED SOLAR POWER (CSP)

The CSP technology applies sun-tracking curved mirrors (called parabolic troughs) to maximize the sun's energy and consequently the efficiency of heat production. The sun-rays are captured and reflected onto a receiver pipe filled with a heat transfer fluid that is located in the central point of the troughs. Here the concentration and a significant better utilization of the sun's energy is obtained.

The flexibility of the technology enables high temperature generation for power production as well as lower temperature generation for heat production. To avoid typical operational challenges, such as overproduction, the mirrors can be defocused or the system can be shut down entirely if required so.



FLAT PANEL COLLECTORS

As the only Danish company within GREENoneTEC's distribution channel, Aalborg CSP offers high quality solar collectors for the district heating market with a 10-year warranty. The single and double glazed GK 3003 series solar panels with up to 13m² overall area have demonstrated the best performance in international tests.

A special design of the absorber and the attractive Wperformance data make these collectors ideal for large solar thermal systems. The solar collectors are characterized by high performance at lower temperatures and largest energy production around midday.



COMBINATION PLANT

The combination of flat panel collectors and the CSP technology enables greater efficiency thereby lowering energy costs to a large extend.

The mix of the two technologies is a perfect match as both systems deliver exactly 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.



HEAT STORAGE ACCUMULATION TANK

Even though solar energy systems are dependent on good weather conditions, performance of such plants can greatly be extended with a back-up accumulation tank that is capable of storing heat for several days.

On cloudy days when the sun is not shining, the accumulation tank allows the stored heat to be used to prolong energy production. At hours with lower solar collector performance (morning/evening) the stored heat can also be used to create a more balanced daily heat generation. In wintertime, the water in the tank can act as a frost protection for the solar collectors, thereby increasing its efficiency on colder months.

LOWERING ENERGY COSTS OF HEATING

- WITH DENMARK'S MOST ADVANCED SOLAR DISTRICT HEATING PLANT

COMBINED HEAT AND POWER GENERATION

CSP INTEGRATED WITH A BIOMASS-ORC PLANT



Project facts

- Area**
 - 4,039m² CSP solar collectors
 - 5,972m² flat panel collectors

Combi solar heating plant

- 6,082MWh / year
- 840 households
- 30% solar energy share

Cost savings

- 15% saving / household

Environmental savings

- 23,000 tons CO₂ / 20 years

Combination plant for highest efficiency

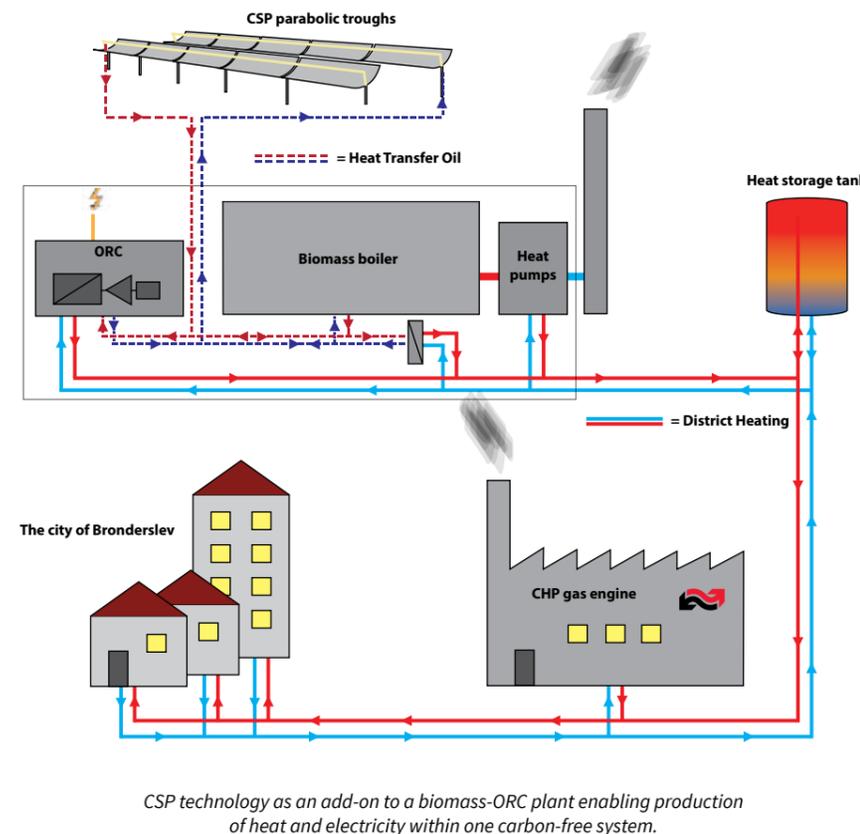
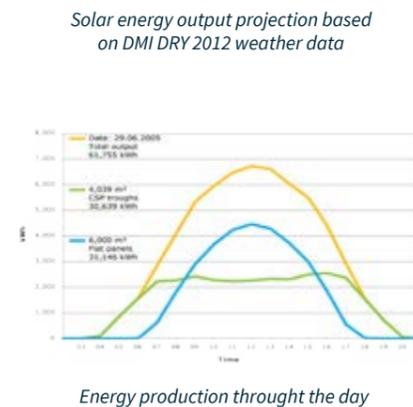
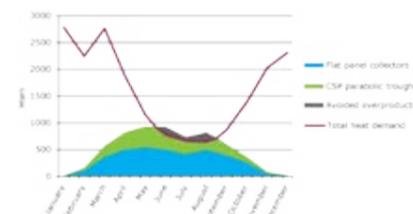
30% of the heat production in Taars (Denmark) is now provided by a globally-unique solar district heating plant developed and supplied by Aalborg CSP.

The system is the first of its kind in the world where flat panel collectors are combined with concentrated solar power parabolic troughs. The mix of the two technologies is a perfect match as both systems deliver exactly what they do best: the flat collectors preheat the water which is thereafter boosted by the CSP technology to achieve the final temperature of 90-95 °C. The CSP therefore acts like a turbo engine.

Besides making Taars a greener city, the most advanced solar district heating system in Denmark also achieves 15% price reduction per household annually.

Aalborg CSP has been main contractor on the project as well as delivered the CSP solar collectors.

Estimated energy production



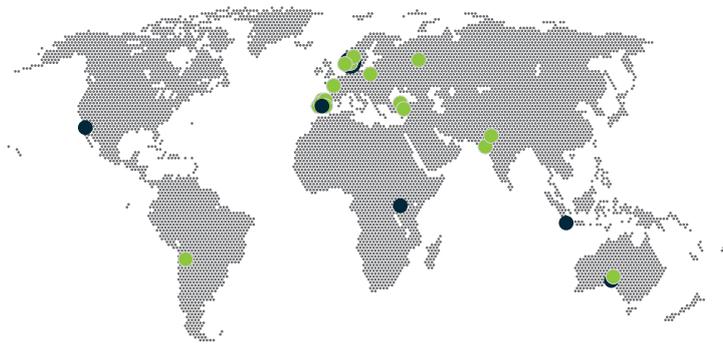
Designed for maximum yield of energy

Aalborg CSP in close collaboration with the Danish district heating plant (Brønderslev Forsyning) has carried out a comprehensive feasibility study on the potential to use concentrated solar power as an add-on to the biomass-ORC plant. Based on the positive findings, Aalborg CSP has been awarded the contract to develop and supply the 16.6 MWt CSP plant enabling production of heat and electricity within one carbon-free system.

The CSP plant is expected to be installed by the end of 2016 and it will consist of 40 rows of 125m parabolic trough loops with an aperture area of 26,929m². The parabolic troughs will collect the sunrays and reflect them onto a receiver pipe wherein a fluid is heated up to 330°C. This high temperature is able to drive an electric turbine to produce electricity, but the flexibility of the system also allows production of lower temperatures for district heating purposes. To maximize yield of energy, the waste heat will be utilized and sent to the district heating circuit whereas electrical power will be generated at peak price periods.

AALBORG CSP

- Changing Energy



Locations ● Selected projects ●

CHANGING ENERGY

Aalborg CSP is leading developer and supplier of innovative renewable technologies with the definite purpose to change the way we produce energy 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 cost of energy for industries and power plants worldwide.



**VALUE-ADDING
ENGINEERING DESIGN**



**TECHNOLOGY OF
TOMORROW**



**MAKING PROJECTS
HAPPEN**



**SECURED TO BE
DELIVERED**

Headquarters:

Aalborg CSP A/S
Hjulgagervej 55
9000 Aalborg
Denmark

Other sales and service locations:

- Spain
- The United States
- Kenya
- Indonesia
- Australia

For sales enquiries contact:

Phone: +45 88 16 88 36
E-mail: sales@aalborgcsp.com
Web: www.AalborgCSP.com