CHANGING ENERGY
around the world

AALBORG CSP
- Changing Energy

”Renewable energy at the lowest possible cost.

That is what Changing Energy means to us and to our satisfied customers around the world.”

JOURNEY TOWARDS
Changing Energy

Aalborg CSP A/S 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, we design and deliver a variety of heat-based green technologies and integrated energy solutions to lower the cost of energy for industries and power plants around the world.

Our 30-years long company history is rooted in the development of traditional power boilers. Therefore, we have a deep understanding of individual thermal energy needs and develop systems with strong focus on optimization. As a result, solutions delivered by Aalborg CSP achieve substantial savings for the end user, excel in performance and contribute to a greener future.

We place strong focus on R&D activities and partner with knowledge-based companies and institutions to create leading-edge technologies.

Headquartered in Aalborg (Denmark) and with sales and service offices in Spain and Australia, we have delivered more than 1,700 MWth cost -effective green energy solutions to a variety of industries worldwide.

FROM IDEA *to reality*

Research & Development

Feasibility study

Pre-engineering

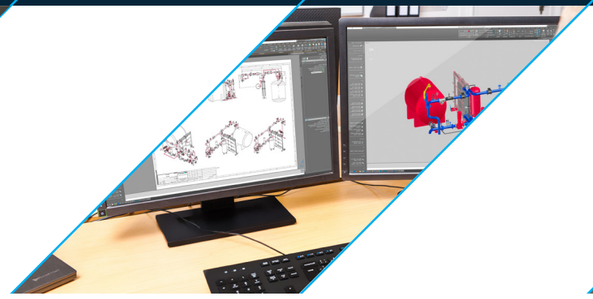
Detailed design

Procurement & Manufacturing

Delivery

Installation & Commissioning

Operation & Maintenance



Turning customer visions into reality is the passion driving our everyday life. In order to propose the most value-adding solutions, we dare to walk new paths and to challenge comfort zones, no matter if it is a Research and Development project or a full-scale energy system.

Keeping our customers' best interest in mind, we bring value to all project stages and ensure delivery reliable on quality, budget and deadline commitments. Our bulletproof project management expertise turns promises into anticipated results because for us agreed commitments are to be met.

Our global energy portfolio shows that no customer request is too small or too large for us. We deliver full-scale green energy systems based on existing technologies, develop new products in collaboration with knowledge-based partners, conduct project feasibilities or maintain operational plants.

No matter what business segment we serve, our core work method steadily relies on a value-adding concept: to deliver solutions that excel in operation, increase plant revenue and contribute to a greener future. By doing so, we take another step forward towards Changing Energy around the world.

ENERGY DEMAND
as key value driver

Heat

Steam

Electricity

Water

Cooling

Our customer's energy demands are the core value drivers when developing the next generation energy systems, aiming to optimally meet year-round needs for the production of heat, steam, cooling, water and power.

In order to do so, we dare to walk new paths and to challenge comfort zones in order to propose the most value-adding solutions. Even if this means to go beyond standard specifications, we do our utmost to utilize given resources in the most efficient way.

AALBORG CSP

TECHNOLOGIES & SOLUTIONS
integrated based on project needs

We utilize mature technologies and integrate them into existing energy systems or into completely new solutions based on project requirements with the aim to achieve substantial cost savings in all project-cycle stages.

Most key components, such as steam generation systems, tower receivers, heat exchangers or parabolic troughs are developed by Aalborg CSP, while others are purchased and integrated into our solutions to match project requirements.

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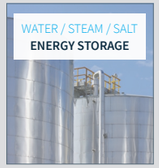
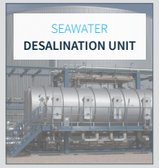
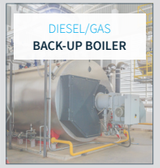






up to 565 °C

500 °C

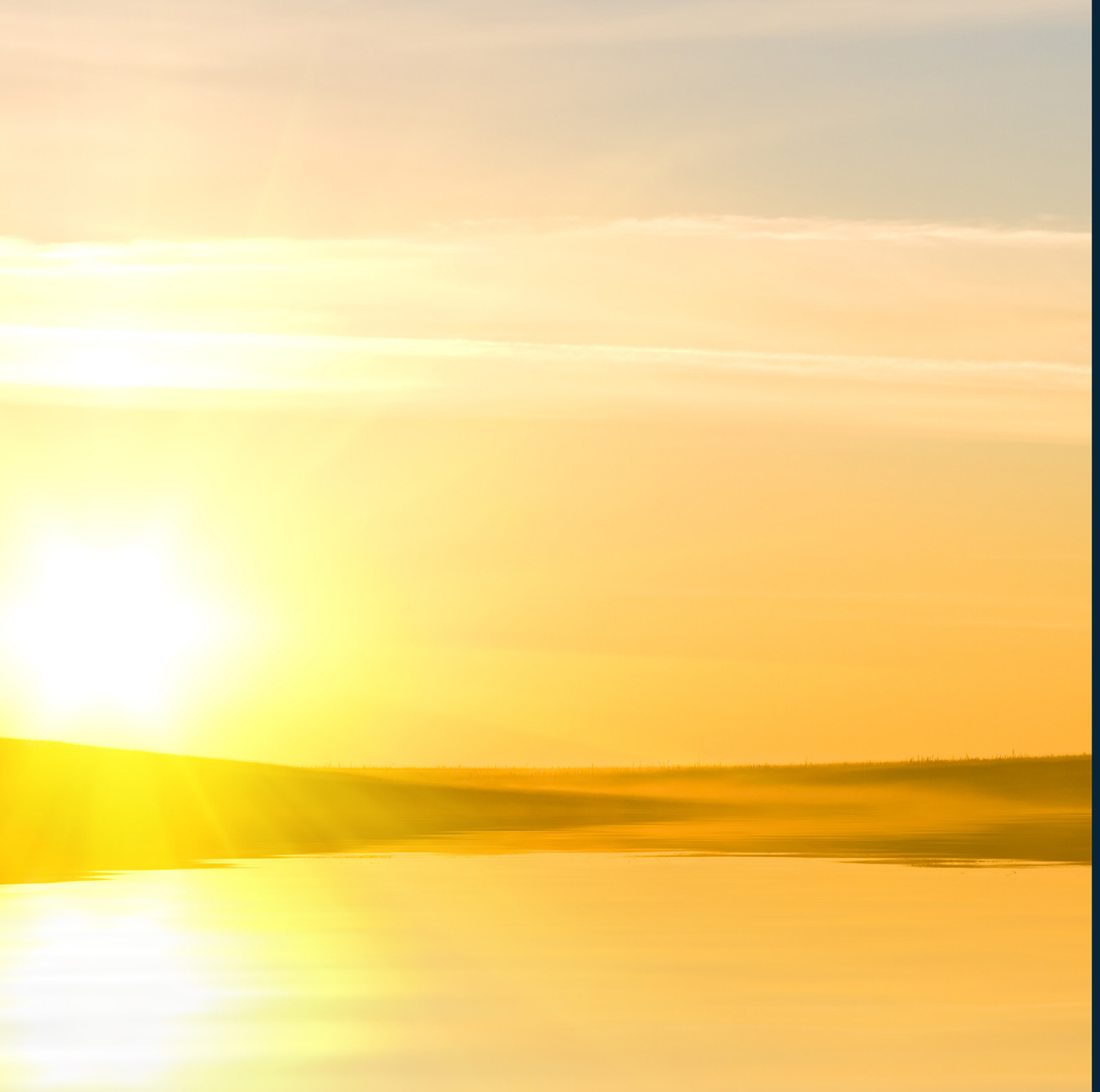
400 °C

300 °C

200 °C

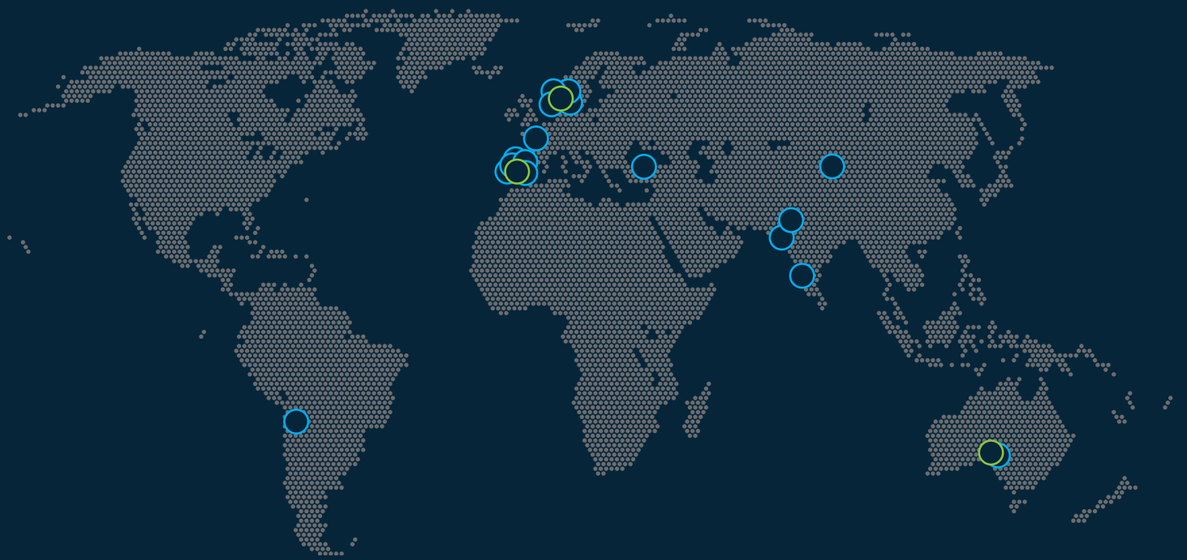
100 °C

from 40 °C



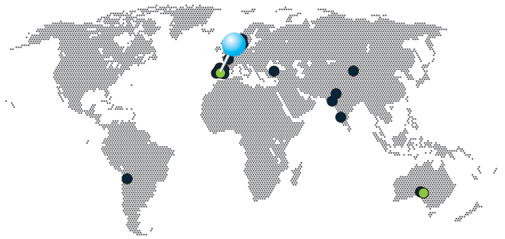
WORLD FIRST

green energy projects



10MWe direct steam
SOLAR TOWER RECEIVER

In 2008, Aalborg CSP was awarded a contract to replace an existing 10MWe solar tower receiver system with a new one. Located in South of Spain, the power station is the world's first commercial concentrating solar power tower plant. With a new central receiver system from Aalborg CSP, forced circulation used for uninterrupted feed water flow was replaced by natural circulation. With this upgrade, plant performance increased by 10%. Raising existing capacity from 10MWe to 11MWe enables the solar power station to generate 23,400 MWh of clean energy per year. To date, the system has been generating saturated steam in the 115m high tower. Aalborg CSP also supplied a complete 13t/h auxiliary steam boiler to the same plant.



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20MWe direct steam
SOLAR TOWER RECEIVER

Based on remarkable performance achievements, Aalborg CSP won another order for a complete direct steam receiver system. The central receiver was intended for the world's second commercial solar power tower in South of Spain with 20MWe capacity. Similarly to the former project, the core design features of the solar tower receiver system are the natural circulation inside the boiler, the high steam purity, the high efficiency and neglectable electricity consumption. The main advantage of the overall system is that the steam is heated directly without any kind of heat transfer fluid. Since it went online in 2009, our central receiver has been generating saturated steam in the 165m high tower with great performance results.

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5X50MWe *thermal oil*

SGS1 & SGS2 STEAM GENERATION SYSTEMS

Between 2009-2011 Aalborg CSP developed and supplied five steam generating systems for concentrated solar power parabolic trough plants located within Europe's largest solar complex in Spain. Each plant produces 50 MW, enough electricity to satisfy the power needs of 25,700 households.

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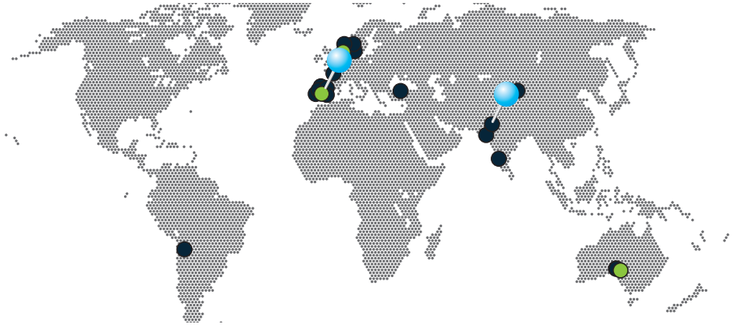
Aalborg CSP's scope included design, engineering, procurement, total installation and commissioning of the equipment from the company's SGS1 and SGS2 product line.



50MWe *thermal oil*

SGS3 STEAM GENERATION SYSTEM

The Godawari 50MW CSP plant is the first commercial concentrated solar power plant in India. It is also the first one in the world to utilize key features of our SGS3 steam generation systems. Since it has gone online in 2013, the SGS3 system won multiple international awards due to the operational benefits it provides, such as fast start-up, guaranteed leakage-free operation and low maintenance requirements. The solar plant produces ~130 GWh green-electricity annually.

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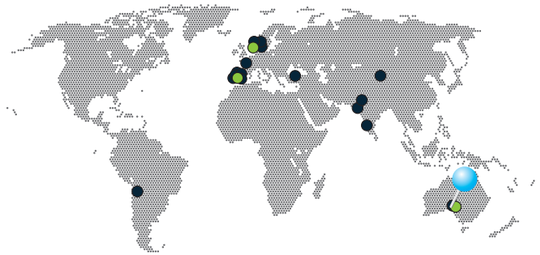
36.6MWth *integrated energy system*

BASED ON CSP

Aalborg CSP developed and supplied a world-first Integrated Energy System to support Sundrop Farm's desert-farming operations in Port Augusta. The concentrated solar power (CSP)-based technology is the first one in Australia, but also in the whole world, to support horticultural activities at commercial scale. In this case, more than 17,000 tons of tomatoes are produced annually in 200,000m^2 greenhouses. This accounts for appr.15% of Australia's entire tomato market.



Since it has gone online in October 2016, the Integrated Energy System has been harvesting the sun in the most efficient way to satisfy multiple energy demands for sustainable vegetable growth. More than 23,000 heliostats collect the sun's rays and reflect them onto the 127m high solar tower. Here, the concentration of energy generates high temperatures which is then used to heat the greenhouses, to provide fresh water for irrigation and to produce electricity.

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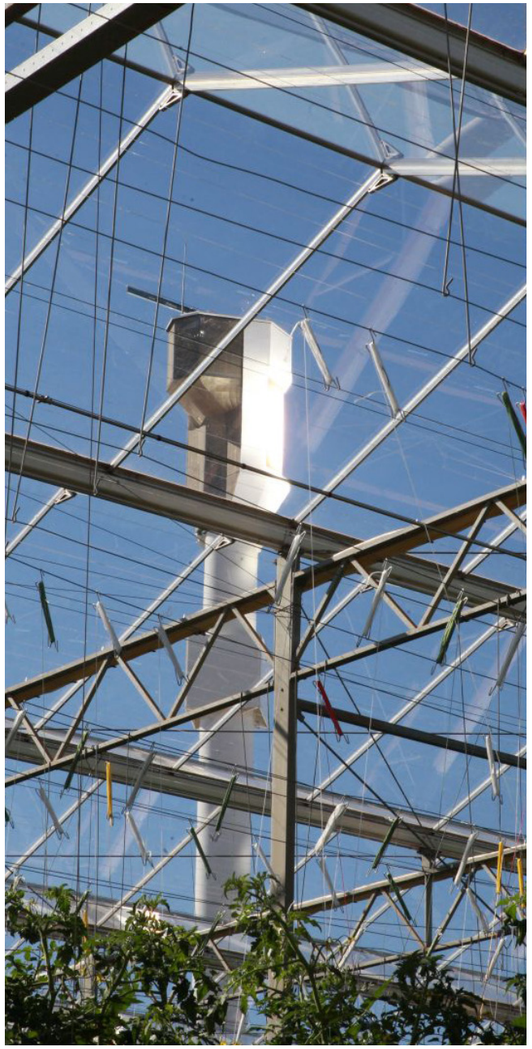

6.8MWth *CSP with flat panels*

FOR DISTRICT HEATING

In 2014, Aalborg CSP designed and delivered Denmark's most advanced solar district heating system for Taars Varmeværk. Located in the northern part of the country, the system consist of a 4,039m^2 CSP plant and a 5,972m^2 flat panel field. Flat collectors preheat the water which is there-after boosted by the CSP technology to achieve the final temperature of 98 °C. With a 6,082MWh annual production, the system supplies 31% of the district heating plant's annual energy needs.

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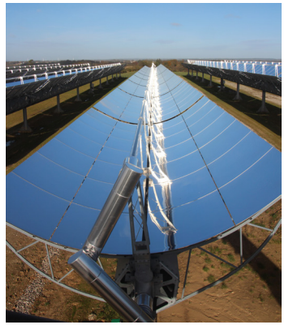

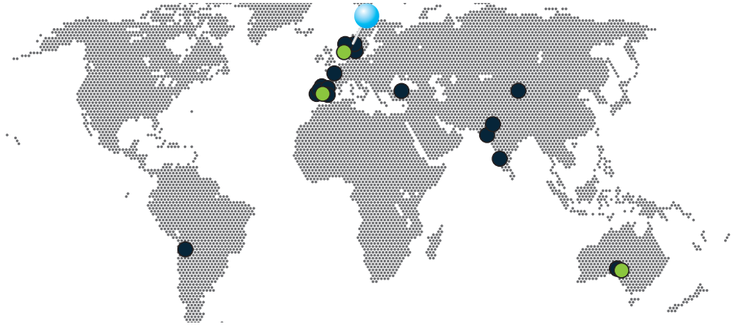

16.6MWth *CSP with biomass-fired ORC*

FOR DISTRICT HEATING AND POWER PRODUCTION

Aalborg CSP participated in a revolutionary project carried out by a visionary district heating plant, Brønderslev Forsyning. The project is the first combined heat and power (CHP) plant in the whole world to integrate concentrated solar power (CSP) and a biomass boiler while also using Organic Rankine Cycle (ORC) to turn the energy into district heating and electricity. Aalborg CSP delivered the 26,929m^2 CSP plant that has been excelling in operation since the start-up in 2016.

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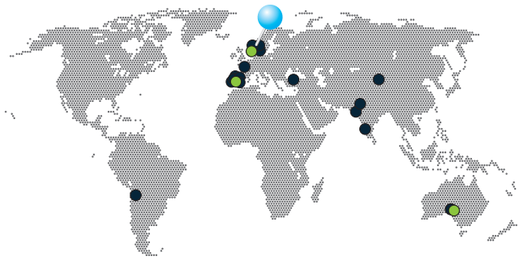
1.9MWth *flat panels*
FOR DISTRICT HEATING

In order to reduce a Danish district heating plant's (Solrød Fjernvarme) natural gas dependency as well as to stabilize its energy prices, Aalborg CSP investigated the potential to use solar heating in the capital area of Denmark. To match the client's energy requirements at the lowest possible cost, Aalborg CSP's technology selection favored a 2,569m^2 flat panel system along with a 1,250m^3 heat storage accumulation tank, thereby providing 350 households with sustainable heating. Since the start-up in Spring 2017, it has been performing beyond expectations.



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8MWth *flat panels*
FOR DISTRICT HEATING

In June 2018, Aalborg CSP has cut the ribbon on its fifth solar district heating project in Denmark. The brand new 11,312m^2 solar district heating facility is located in Smørum, the capital area of the country. The solar field is capable of producing 5,568 MWh heat annually and thereby sustainably contribute to meeting 2,583 consumers' heat and hot water demands. Since operational, this green energy facility has outshined all expectations. Due to Danish weather records in May, it produced 40% more energy than anticipated, covering nearly 100% of the city's hot water and heat demands.

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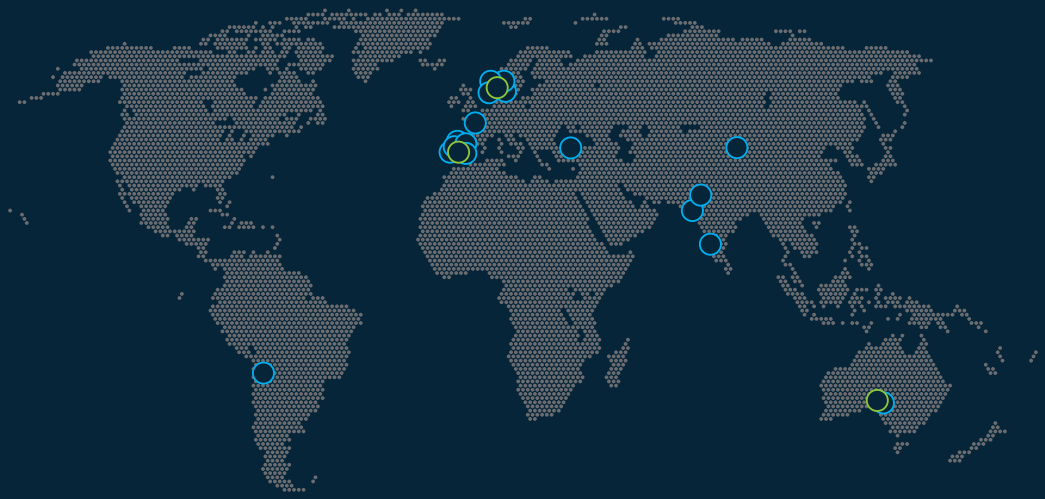

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