Changing energy

*with the most efficient harvesting of the sun*

Company overview and case studies

Brisbane 2016
Personal introduction

Peter Badstue Jensen - 37 years of working experience

- Director – R&D – IES Sales – Stakeholder Member of the Board of Directors
- Project Manager International large power projects Aalborg Industries A/S
- Technical director in PT. Aalborg Indonesia, Jakarta, building a boiler workshop
- Commissioning engineer Aalborg Boilers
- Marine engineer in Dansih Navy and commercial fleet
- Boiler Smith.

My way to CSP

- Welding Boilers
- Operating Boilers
- Selling Boilers
- Designing Boilers
- Selling Steam Turbines
- Designing unique energy systems
- Managing Power projects
- Managing Boiler Companies
- Founding the company
VISION & MISSION

Our Vision

Changing Energy
accelerating the world’s renewable energy transition by making more competitive
green energy solutions.

Our Mission

to develop and supply
green technologies
and integrated energy solutions
to lower cost of energy
for our customers.
BUSINESS AREAS

CSP power plant technologies
- Solar tower receiver (direct steam)
- Solar tower receiver (molten salt)
- Steam generator system (thermal oil)
- Steam generator system (molten salt)
- Fresnel steam island

Integrated Energy Systems
Novel configuration of renewable technologies with CSP acting as focal point of the system to holistically satisfy multiple energy needs for:
- heating
- clean water
- electricity
- process steam
- cooling
- mechanical power

Solar district heating
- Solar heating
- Solar cooling

Thermal Energy Storage (TES)
- Direct-steam-to/from-concrete storage
- Storage for CSP plants with thermal oil

In collaboration with:

EnergyNest

Industrial CSP solutions
- Sun-powered process steam production
- Sun-powered hot water production
- Solar electricity
- Solar desalination
- Solar cooling
CHANGING ENERGY

SOLAR FIELD
- Tower DST/MS
- Parabolic Trough HTF/DST/MS
- Fresnel or Parabolic Fixed receiver HTF/DST/MS
- Flat panel collector

OTHER RE SOURCE
- Wind Turbine
- PV

THERMAL STEAM
- TES Concrete Steam Concrete Storage
- Steam drum
- Steam drum with Steam/water heater

ELECTRICITY/CONVERSION
- Steam turbine Generator
- Steam turbine Mech. drive
- Steam condenser
- Steam condenser & Cooling tower

THERMAL USAGE / COGEN
- Thermal Desalination
- Reverse Osmoses
- Absorption Chiller
- Process heat

Wind Turbine
- Steam turbine
- Generator
- Absorption Chiller
CASES

Harvesting the sun in the most efficient way

...integrating technologies
...to achieve lowest possible cost of energy

CASE 1:
The world’s first Integrated Energy System based on CSP

CASE 2:
Denmark’s most advanced solar district heating system
CASE 1. SUNDROP FARMS

Sundrop Farms Port Augusta South Australia
CASE 1.

The world’s first Integrated Energy System based on CSP

The client:
Sundrop Farms is a leader in sustainable horticulture for the arid world; growing high-value crops using seawater and sunlight

Assignment:
Sundrop Farms has contacted Aalborg CSP to develop and supply a renewable energy system based on the concentrated solar power technology to enable sustainable operation of 200,000m² greenhouses for the production of 15,000 tons of tomatoes annually in the South-Australian desert.

Resources to work with:
- Sun
- Seawater

Great solar resources + Seawater from Spencer Bay (5km from the location)
CASE 1.

The world’s first Integrated Energy System based on CSP

Pre-engineering:
• **Study:** determined technical and economical viability of the project and the scope of the system
• **Chosen technology:** CSP tower technology for direct steam generation

Value-adding engineering design:
• **Multiple energy streams:** thermal energy is used to provide heating, fresh water and electricity
• **Year-round operation:** seasonally balanced energy system to achieve reliable operation day and night, 365 days a year
• **Lowering energy costs:** up to 80% powered by solar energy

Turnkey delivery:
• As tunkey supplier, Aalborg CSP is responsible for complete design, component deliveries, construction as well as commissioning of the plant
CASE 1.

The world’s first Integrated Energy System based on CSP

**Status:**
- Construction phase

**Expected to go operational**
- Second half of 2016
CASE 2.

Denmark’s most advanced solar district heating system

Status:
• Operational since August 2015
CASE 2.

Denmark’s most advanced solar district heating system

The client:
Located in the northern part of Denmark, Taars Varmeværk provides district heating for Tårn, a town with 1,900 citizens.

Assignment:
Aalborg CSP was contacted by Taars Varmeværk’s engineering consultant to suggest the best solar district heating system for a town with 840 households. The aim was to find the most optimal solar heating system in terms of performance and economy.

Resources to work with:
• Sun
CASE 2.

Denmark’s most advanced solar district heating system

Pre-engineering:
• **Study**: determined technical and economical viability of the project and the scope of the system
• **Chosen technology**: CSP parabolic trough combined with flat panels

Value-adding engineering design:
• **Perfect match of technologies**: flat collectors preheat the water which is thereafter boosted by the CSP technology to achieve the final temperature of 98 °C.
• 30% is the highest DK city coverage by the sun.
• **No need for seasonal storage**

Turnkey delivery:
• As tunkey supplier, Aalborg CSP was responsible for complete design, component deliveries, construction as well as commissioning of the plant

- 6.082 MWh/year heat production
- 30% savings/household
- 4.039 m² + 5.972 m²
GLOBAL PRESENCE

Headquarters:
Denmark
Hjulmagervej 55, Aalborg 9000

Other sales and service locations:
Spain
The United States
Kenya
Indonesia
Australia

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HOW TO PROCEED

Feasibility studies

R&D in Aalborg CSP

Concrete Storage Steam and Thermal oil
Foil Heliostats lowering cost
Molten Salt receivers and storage
Standardization and ESCO models
Parabolic Troughs
Integration of flat panels
Storing and retrieving electricity as thermal energy.