Savosolar

Solar thermal technology taken to the next level

Solar district heating – High efficiency Savoaolar solar thermal plants in Danish district heating systems

International Energy Conference

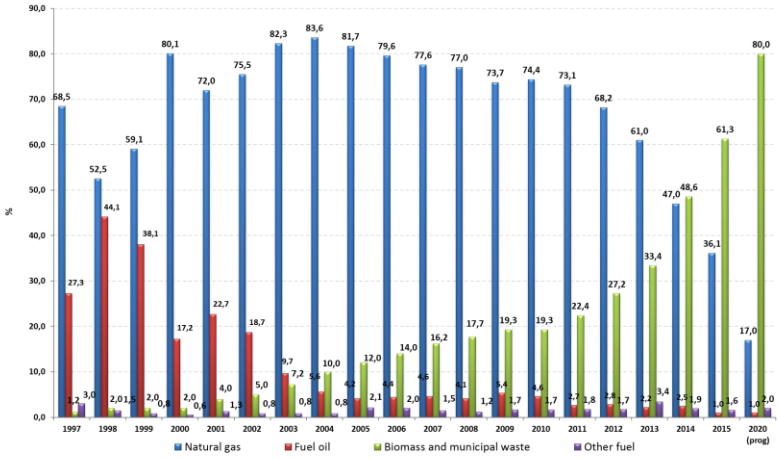
Energy Efficiency and Innovations in the heat sector

Lithuanian and European Experience

Vilnius, 4 December 2017

Solar thermal
– a role in the Lithuanian DH sector?

- Presentation of Savosolar – technology and references
- Solar district heating experience in Denmark
- Solar district heating and biomass – synergies?
- Next step – identify projects and partners



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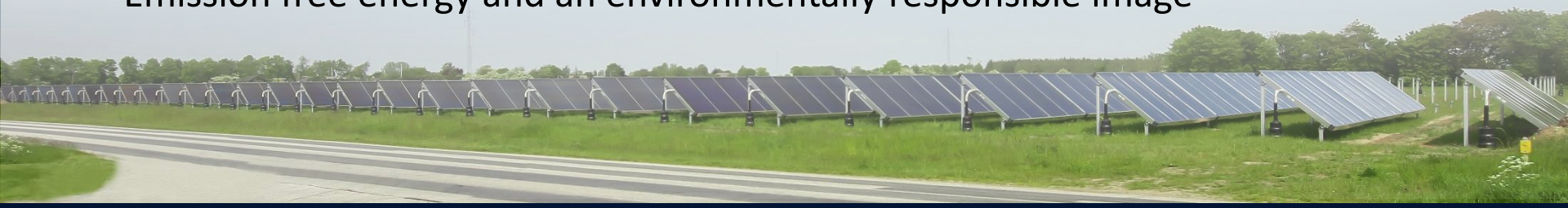
Our customers face

- Constantly rising energy prices
- Business models without the possibility to forecast energy costs
- Public pressure and legal obligations to lower greenhouse gas emissions
- Politically dependent fuel costs and fuel availability

Interest rate and depreciation are the costs

Savosolar offers

- The highest efficiency in the market, and thereby the lowest possible energy cost over 25 years
- Energy price stability over 25 years
- Independent energy production without fuel costs and less political dependency
- Emission free energy and an environmentally responsible image



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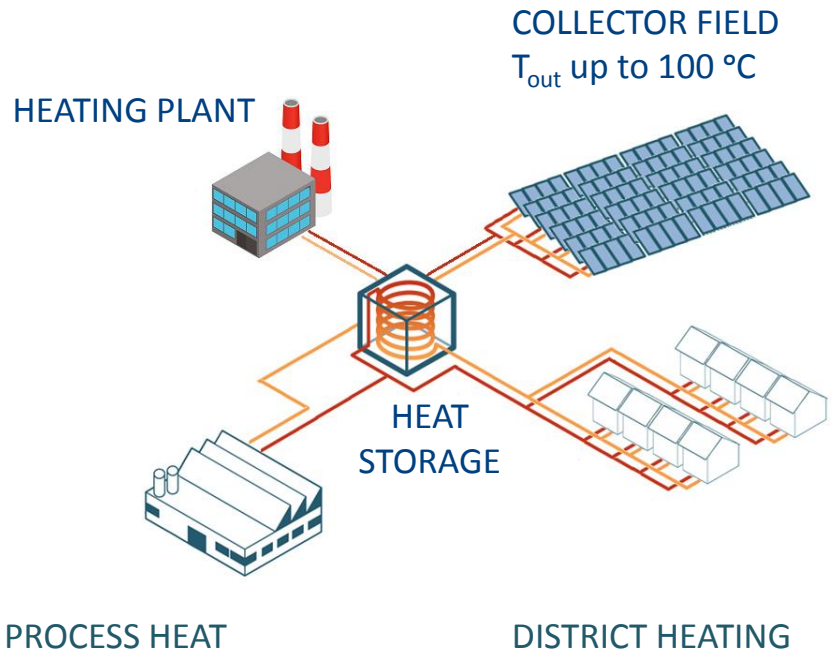
Solar thermal plant – turnkey

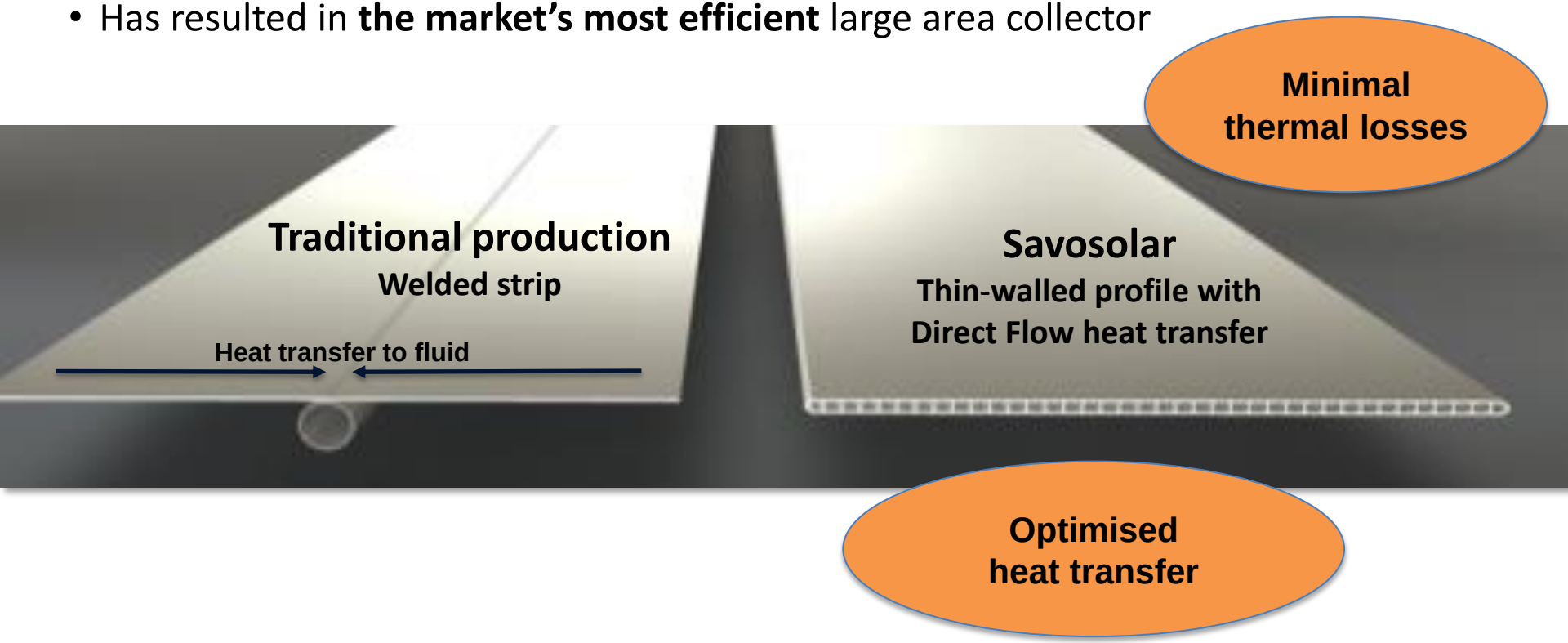


- Savosolar work with local partners
  - Local economy
  - Local competences
- The whole solar thermal system, comprising:
  - Collector field
  - Piping (solar field and transmission)
  - Pumps
  - Heat exchanger
  - Control
  - Heat storage (tank)
  - Building
  - Ground works

Savosolar winning market concept

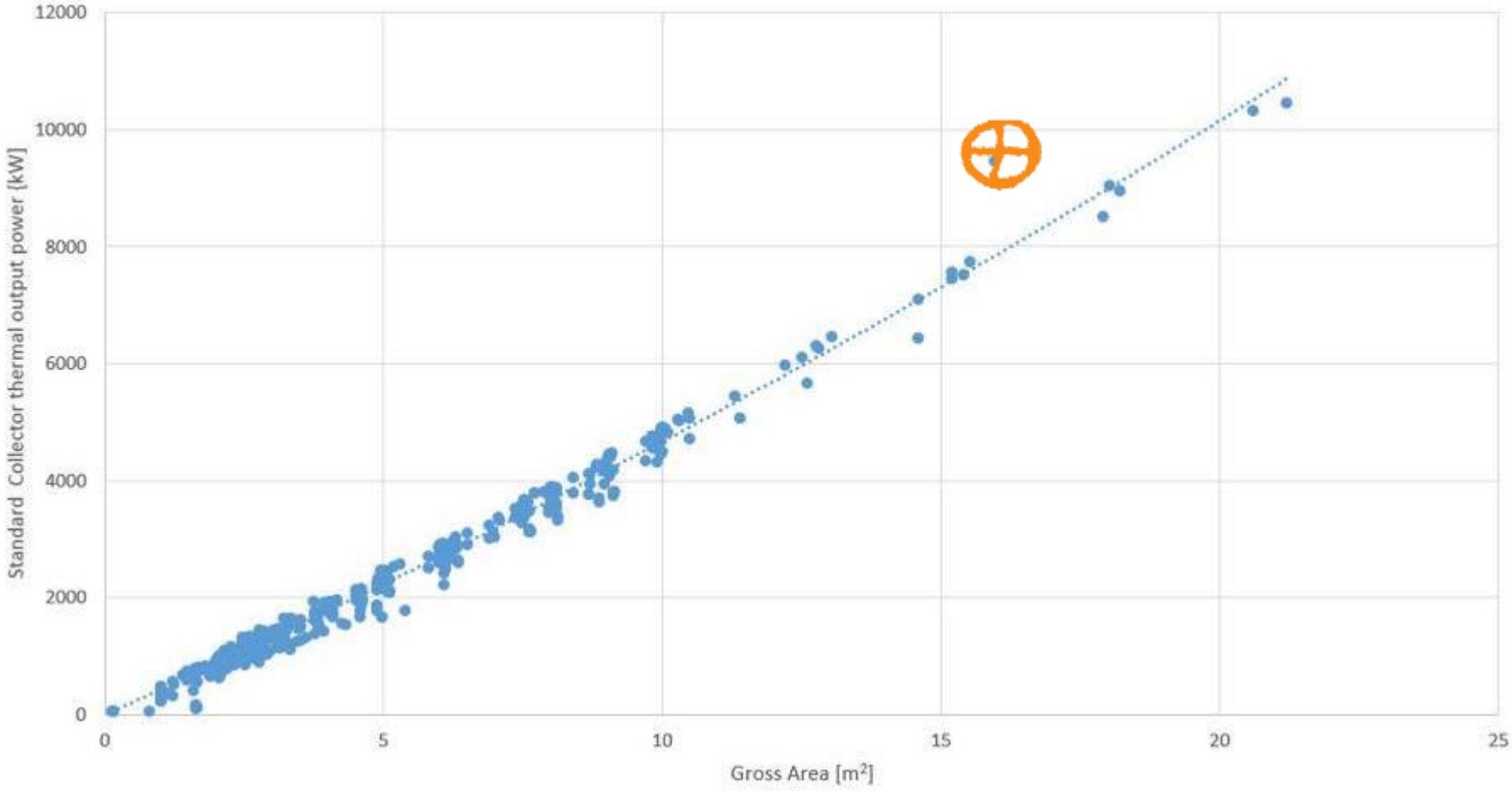
Unique technological advantage

- **Absorber strips** made from aluminium profiles as used in automotive heat exchangers
- One-of-a-kind **coating** technology, which makes it possible to coat entire absorbers after assembly
- Has resulted in **the market's most efficient** large area collector



The most efficient collector in the world

Collectors in Swiss subsidy list



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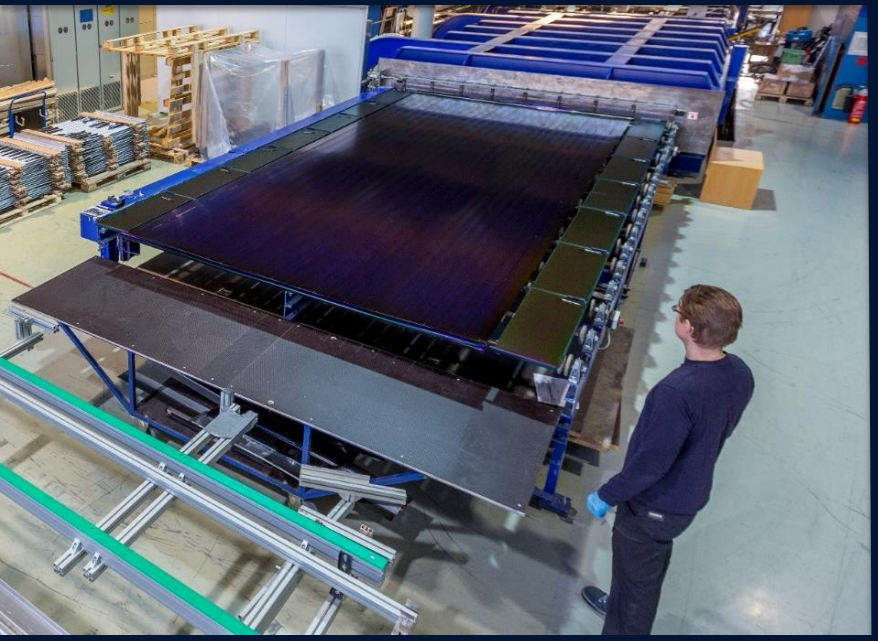

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Further advantages

- Awarded with the Intersolar Award 2011 for “the biggest absorber development in the industry the last 30 years”
- Double glazed collectors with superior glass insulation
- Solar Keymark certified and ISO 9001 certified
- Only producer of large area collectors with PED module II certification according to directive 97/23/EG of the European Parliament
- Mounting solutions for both fields and roofs – fields preferred
- Etched (as opposed to coarted) anti-reflective glass treatment without deterioration over time
- Several large scale district heating solar fields – up to 15,300 m^2 in size

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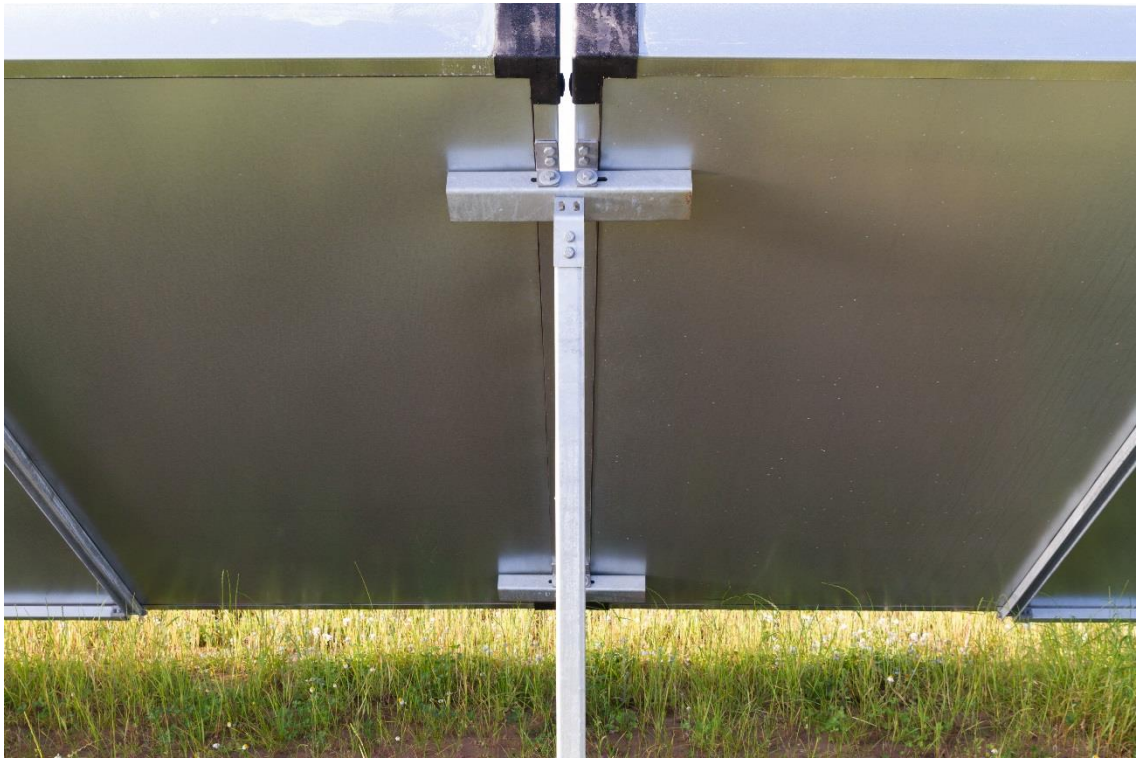
Minimal thermal losses in connections

- Integrated connection hoses (patent pending)
  - Minimises thermal losses in the connections
  - Allows for mounting with only 40 mm distance between panels
  - Reduces shadowing effects compared to traditional connections
  - Protects the connection hoses from external wear from weathering and bird attacks

Maximum use of available land – heat density

- Shared collector foundations (patent pending)
  - **Minimises** the number of foundations
  - Ensures that collectors are **aligned** with each other
  - Offers a **visually** pleasing result which is less noticable in the landscape



Jelling Varmeværk, Jelling, Denmark – 15,300 m²

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Danish record for production:
4.97 kWh/m2 in one day

Double stanchions

Jelling Varmeværk, Jelling, Denmark – 15,300 m²

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Jelling Varmeværk, Jelling, Denmark – 15,300 m²

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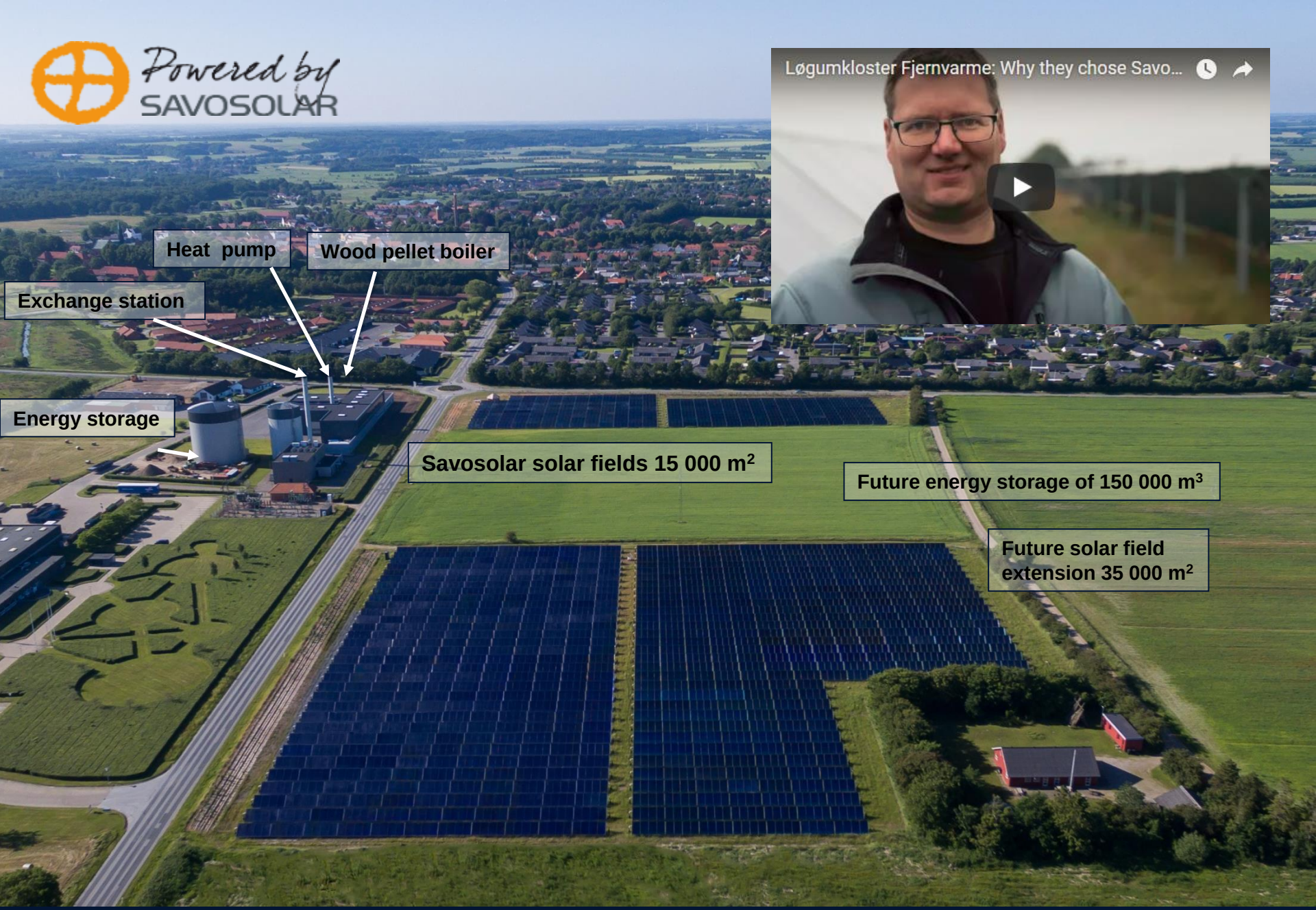

Løgumkloster Fjernvarme, Løgumkloster, Denmark – 15,300 m²

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Combination of single-glazed (SG) and double-glazed (DG)

Sewer pipeline

Lolland Forsyning, Søllested, Denmark – 4,700 m²

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SG and DG
Double stanchions

Very wet land area – high heat density was important to meet customers requirements

Fors A/S, Jyderup, Denmark – 9,200 m²

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High heat density also important for roof installations

Ystad Energi, Ystad, Sweden – 530 m²

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Retirement home, Lahti, Finland – 250 m^2

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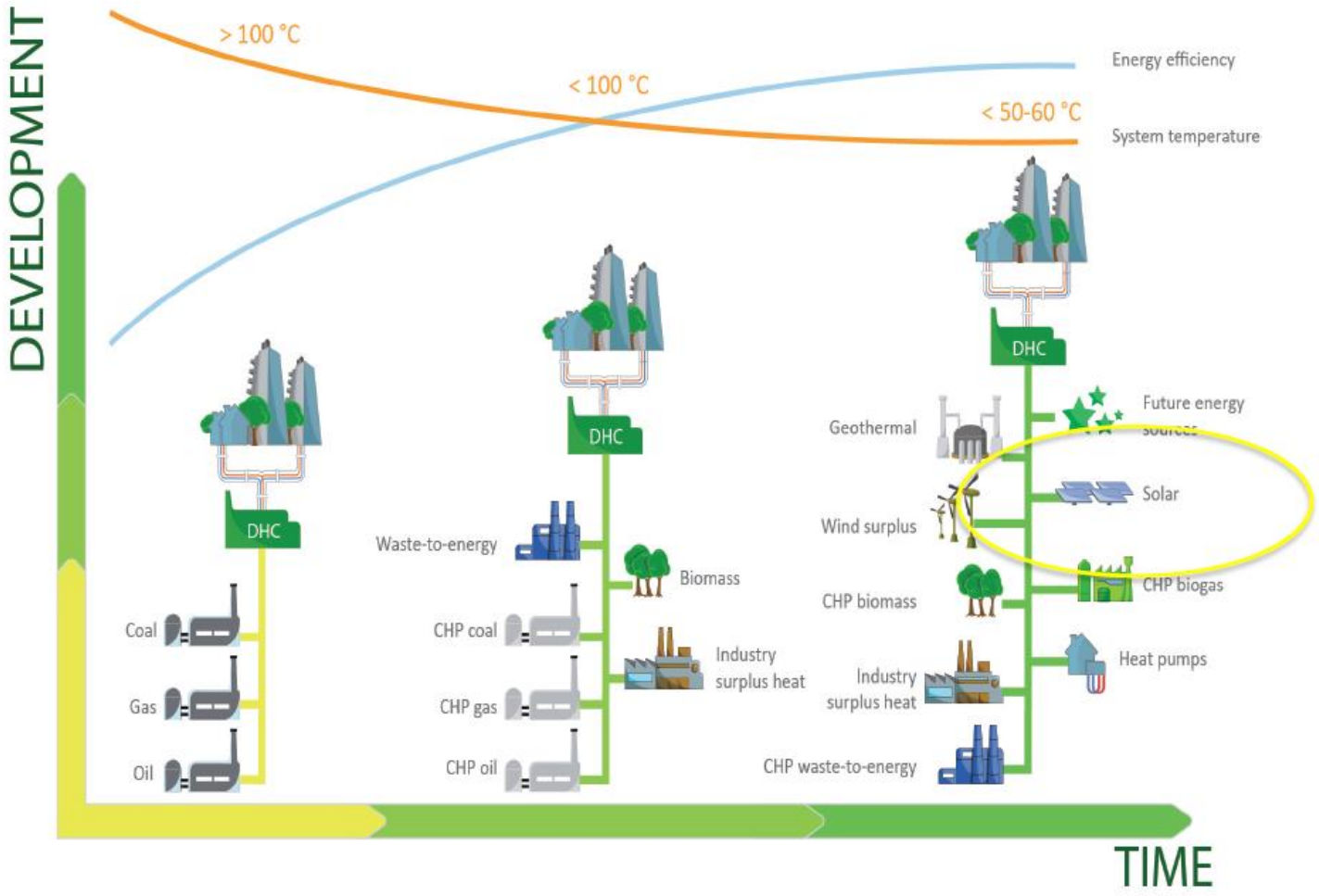
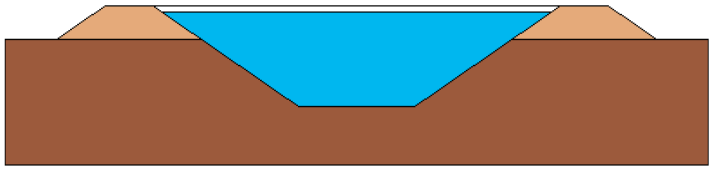
District heating development



Euroheat & Power, www.4dh.eu

Heat storage – enabling diversification

- Heat storage is always required for solar thermal
- Diurnal or seasonal – different technologies
  - Diurnal – tank storage, 20-35 % solar fraction
  - Seasonal – e.g. pit thermal heat storage, 50-70 % solar fraction



Solar district heating in Denmark

- Phases of a solar thermal system
  - Preparation and planning
  - Establishing
  - Commissioning
  - Operation and maintenance
- Target groups
  - Boards
  - Municipalities
  - Operators
- Six examples of solar district heating systems
  - Based on interviews
- Links to more information
  - E.g. www.solarheatdata.eu

http://task55.iea-shc.org/publications

Solar district heating in Denmark

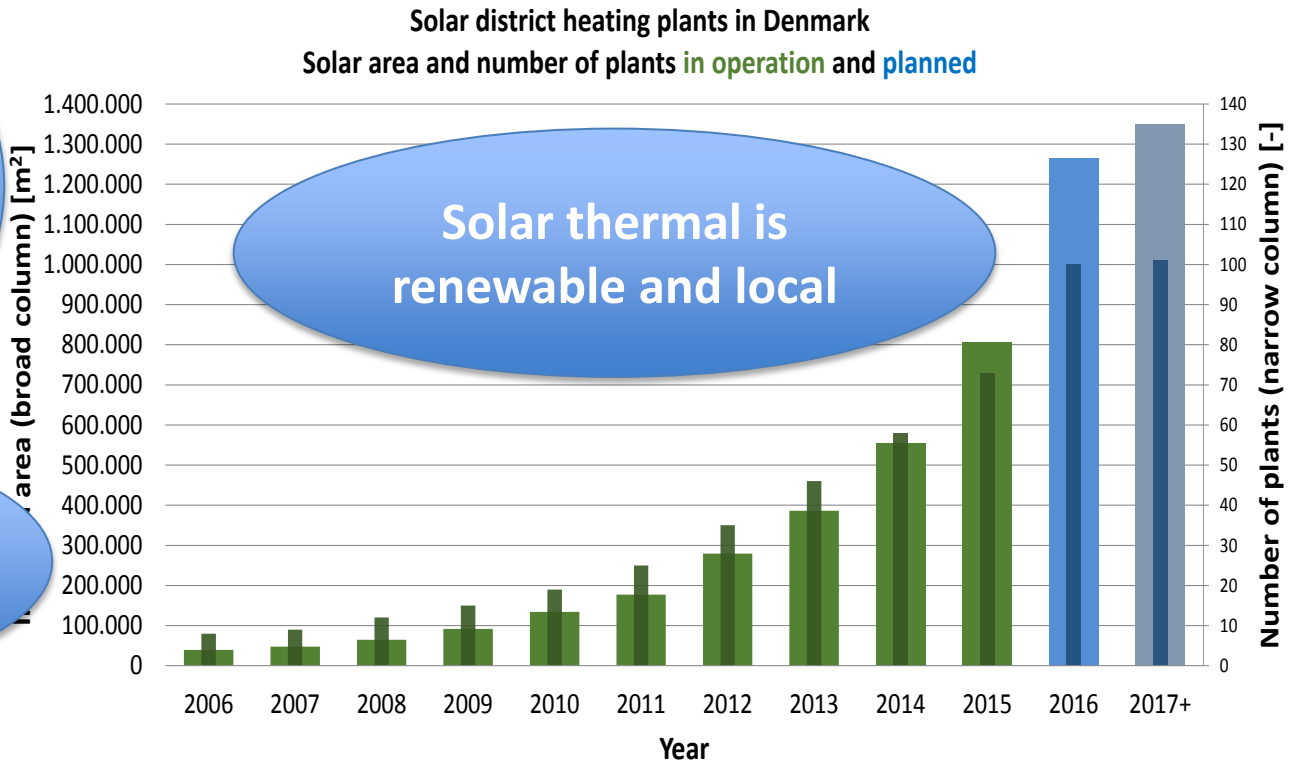
Reduced CHP-production – different production structure

Central – decentral
Diversified systems
Solar thermal is modular; easy to expand and combine with other technologies

Reduction of heat price primary driver for substituting natural gas with biomass

Increased use of biomass
- Environment?

Solar thermal is renewable and local



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Solar thermal and biomass boilers – complementary technologies

- Operation of biomass boiler
  - Saving lifetime of biomass boiler when low/no summer load
  - Reducing operation costs (low for solar thermal)
  - Solar thermal more efficient at lower output temperatures
  - Biomass boiler more stable and efficient operation with heat storage
- Solar thermal characteristics:
  - Stable energy price
  - No emissions
  - No political risk regarding supply of “fuel” (cf. biomass market, regulation)
  - Reducing the area requirement (*20)

SAVOSOLAR - solar thermal technology taken to the next level

Morten Hofmeister, morten.hofmeister@savosolar.com

Please visit www.savosolar.com

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