Task 45 Large Systems

DK report

Jan Erik Nielsen
PlanEnergi

SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

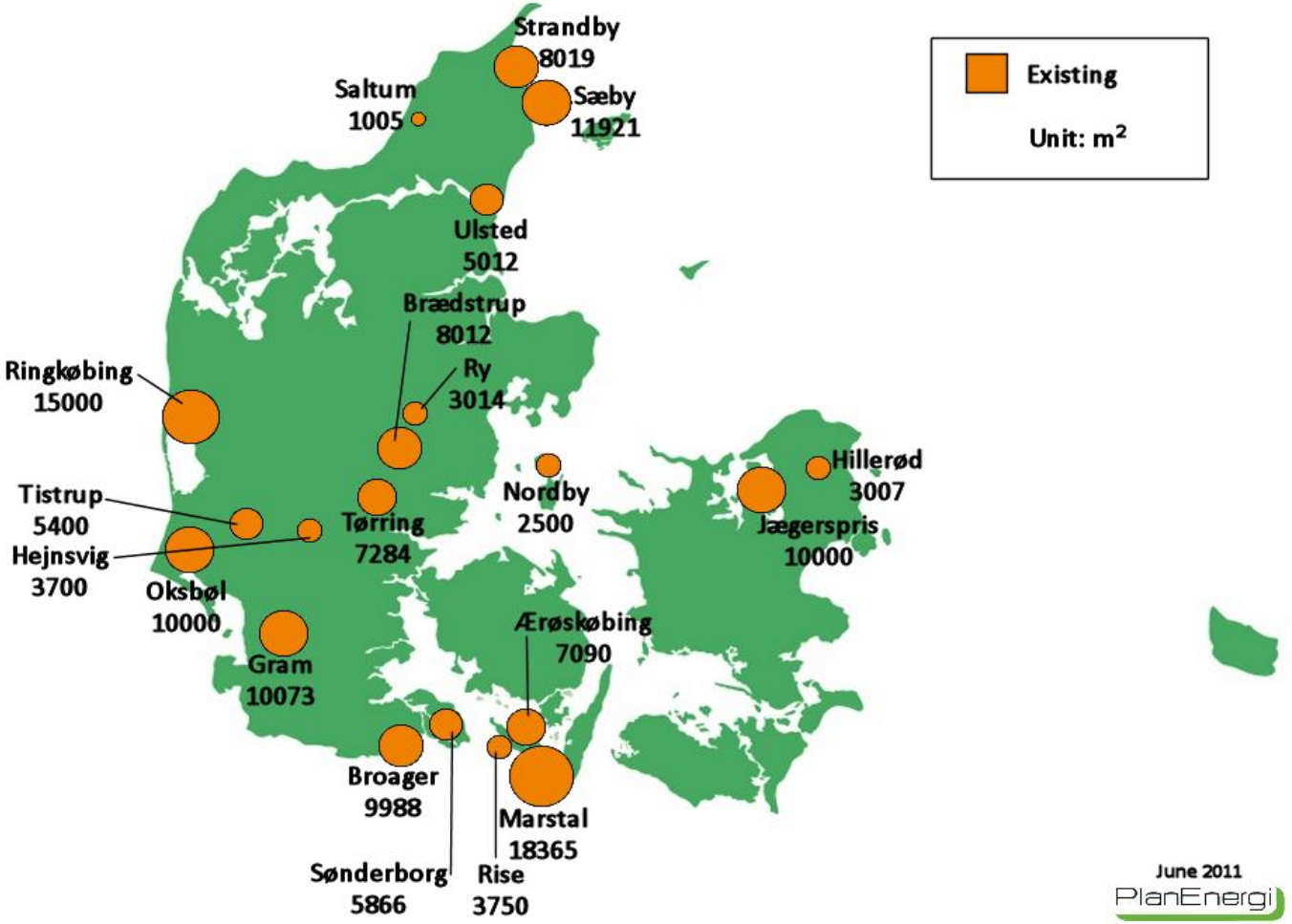
Large Systems
in Denmark

Jan Erik Nielsen
PlanEnergi

2nd Task 45 Meeting, Calgary, Alberta, Canada, October 2011

Task 45 Large Systems

Solar district heating in Denmark



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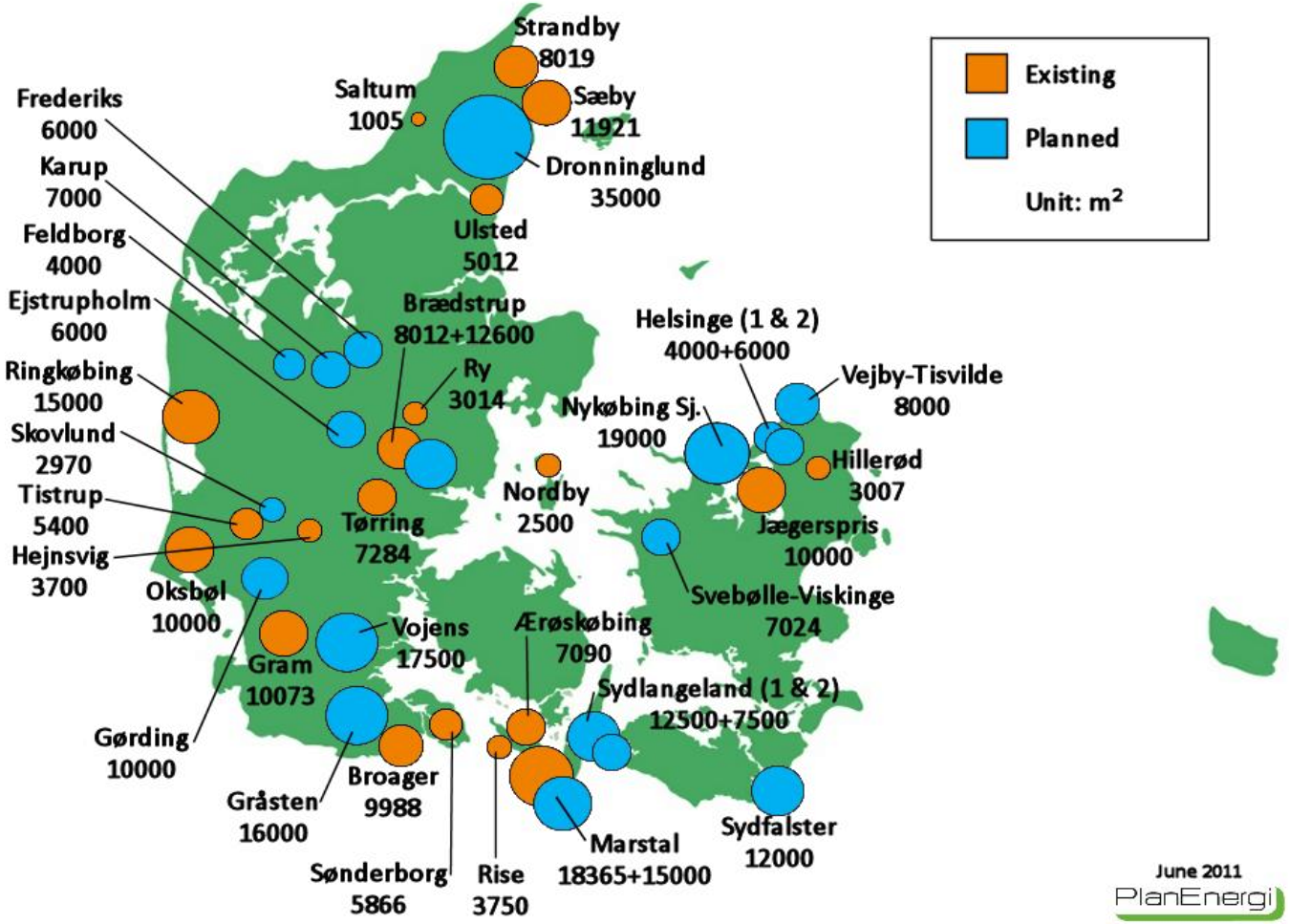
Solar district heating in Denmark



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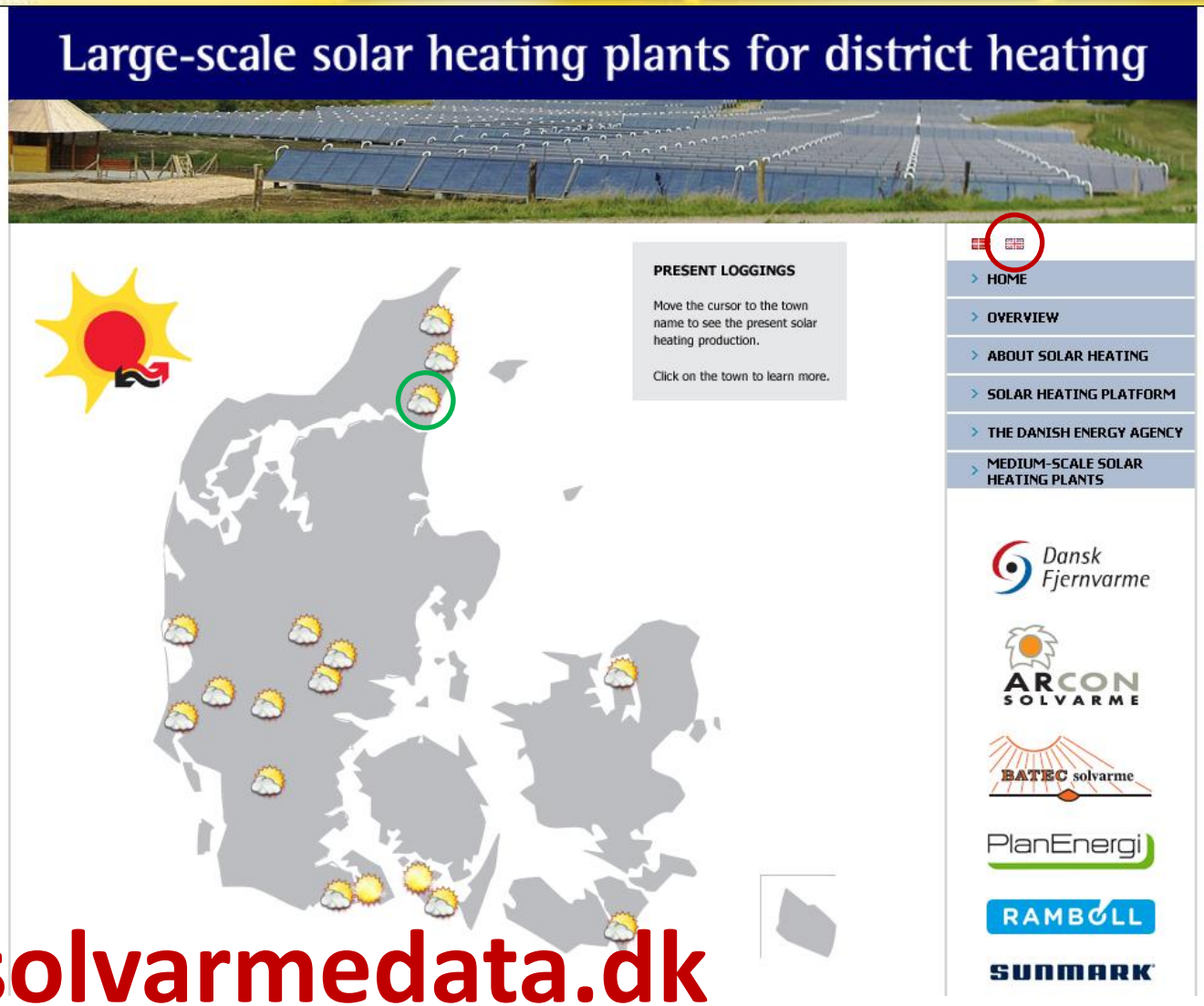

www.solvarmedata.dk

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Year of construction	2006	Construction surface area (m2)	18.100
Solar Heating System	ArCon Solvarme A/S	Number of solar modules (pcs.)	400
Subsidized by	The Danish Energy Agency	Angle of solar panels (degrees)	33
Efficient surface of solar panels (m2)	5.012	Estimated maximum heat efficiency(MW)	3.456

Estimated annual heat production (MWh)	2.202
Expected share of solar heat in total annual plant production (%)	23
Expected reduction of CO2 per year caused by solar heating (tons/yr)	63
Alternative fuel at heating plant (natural gas, wood flakes, straw etc.)	Wood pellets
Investment – subsidies not included (million DKK)	8,6
Subsidies (million DKK)	1,5
Expected net economic result over 25 years (million DKK)	18,0
Return of investment period (years)	9,8

Present solar heat production	1.540	kW
Present solar heat production per m2	307	W/m2
Present solar heat available	660	W/m2
	Logged 23-10-2011 14:11:04	

Historical data

From date: 01-10-2010
To date: 23-10-2011
Units: Months

SHOW DATA

Total solar heat production for the period: 2.361,99 MWh
Total solar heat available for the period: 1.236.065,12 Wh/m2

DOWNLOAD DATA AS .CSV | SHOW GRAPHS

Logs	Heat production (MWh)	Heat production / m2 (Wh/m2)	Solar heat available (Wh/m2)
oktober 2010	108,44	21.637	67.968
november 2010	23,47	4.683	30.931
december 2010	1,49	297	23.722
januar 2011	13,94	2.782	35.101
februar 2011	28,11	5.608	36.726
marts 2011	192,97	38.502	101.984
april 2011	377,33	75.285	157.190

Quick links

Actual 24 hours
Latest 7 days
Latest 30 days
Latest quarter
Latest year

- OVERVIEW
- ABOUT SOLAR HEATING
- SOLAR HEATING PLATFORM
- THE DANISH ENERGY AGENCY
- MEDIUM-SCALE SOLAR HEATING PLANTS

Dansk Fjernvarme
ARCON SOLVARME
BATEC solvarme
PlanEnergi
RAMBØLL
SUNMARK
DFP
SDH solar district heating

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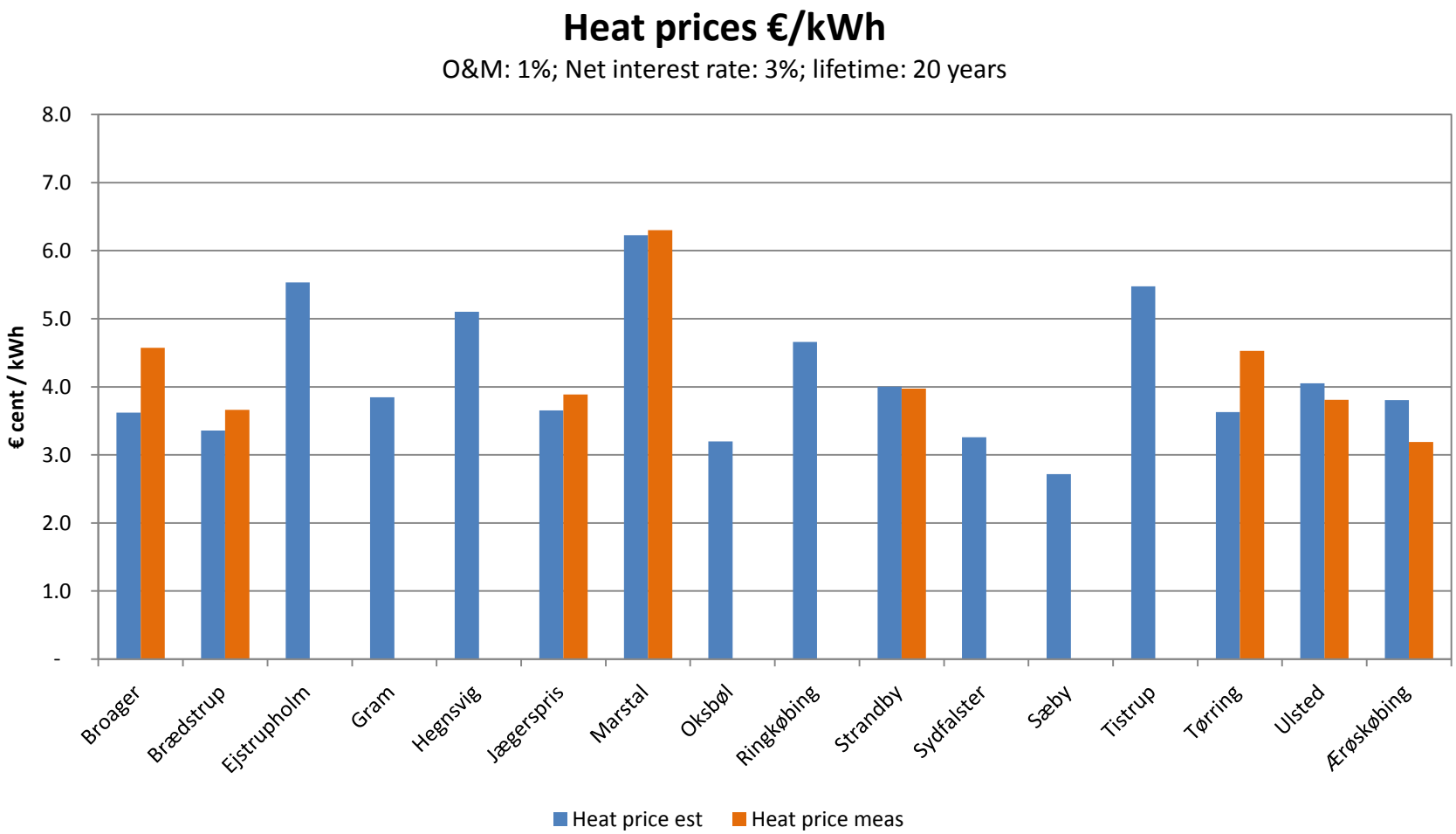
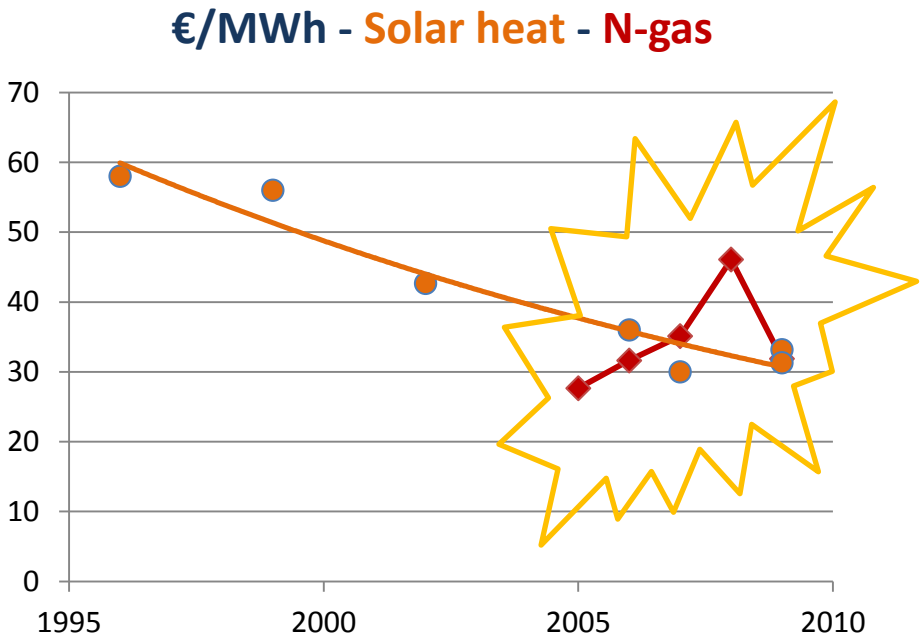
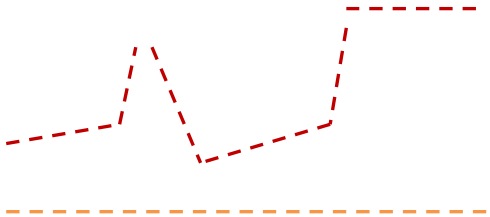

Heat prices €/kWh
O&M: 1%; Net interest rate: 3%; lifetime: 20 years
€ cent / kWh
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
-
Broager
Brædstrup
Ejstrupholm
Gram
Hegnsvig
Jægerspris
Marstal
Oksbøl
Ringkøbing
Strandby
Sydfalster
Sæby
Tistrup
Tørring
Ulsted
Ærøskøbing
Heat price est
Heat price meas

Heating price



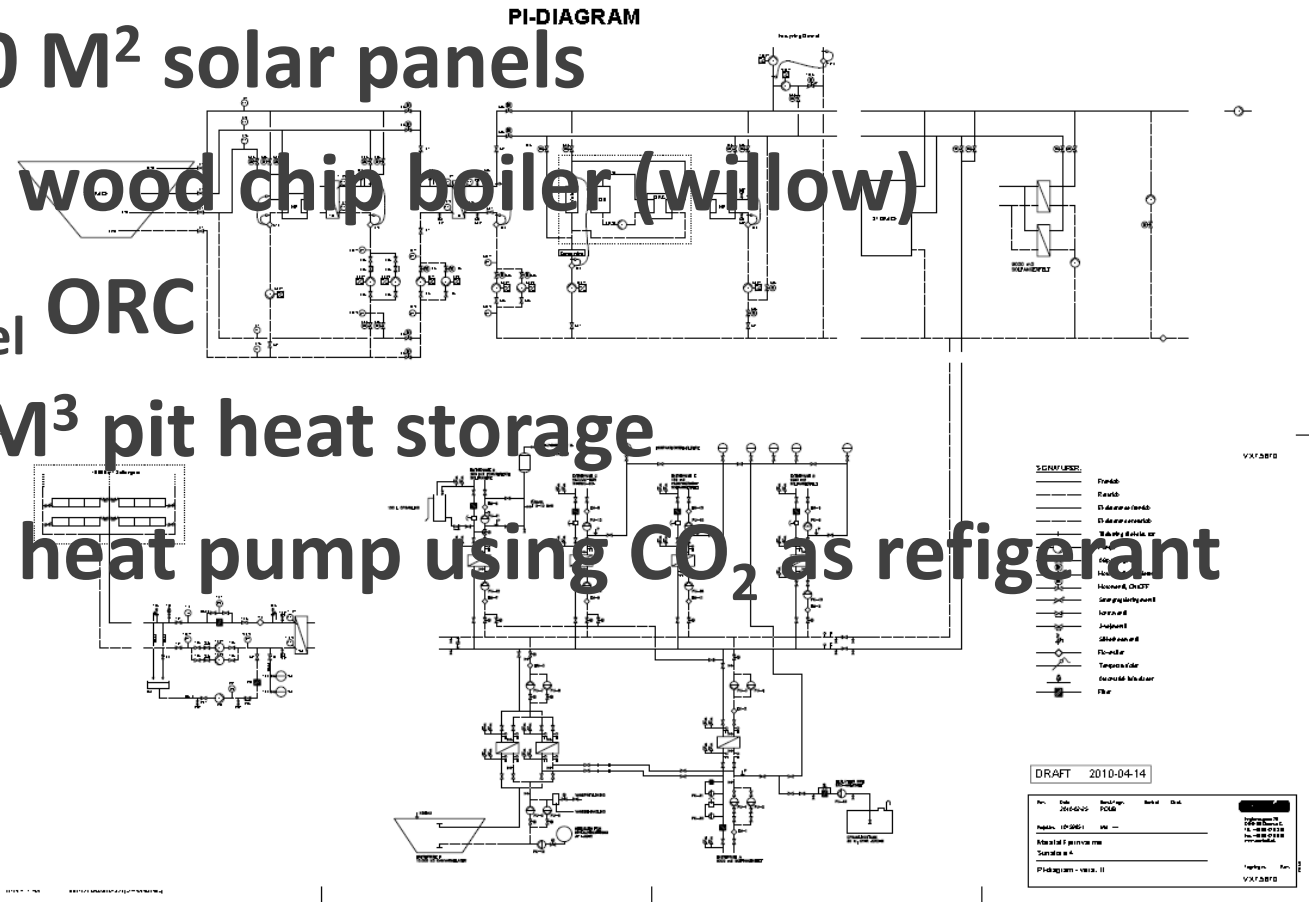
Gas: ? Biomass ?



Solar: →

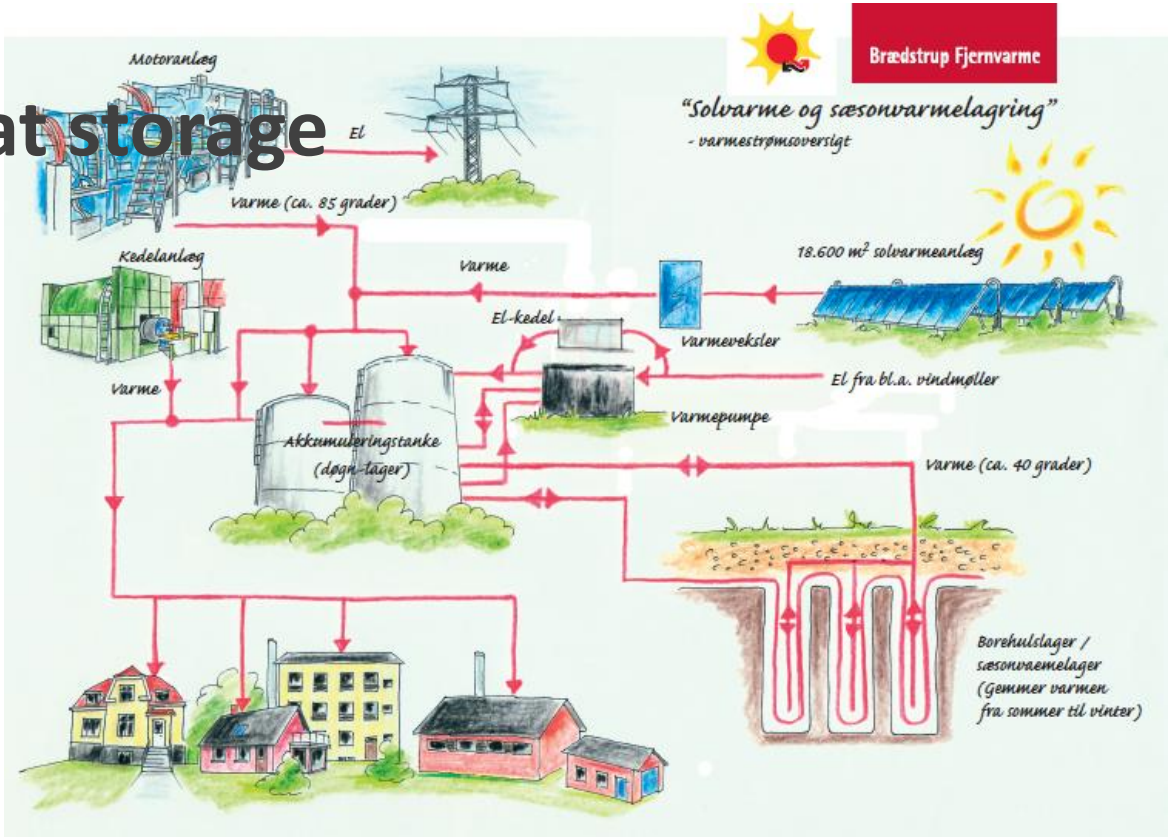
News: SUNSTORE 4 (Marstal extension)

- + 15.000 M^2 solar panels
- 4,0 MW wood chip boiler (willow)
- 750 kW_{el} ORC
- 75.000 M^3 pit heat storage
- 1,5 MW heat pump using CO_2 as refigerant

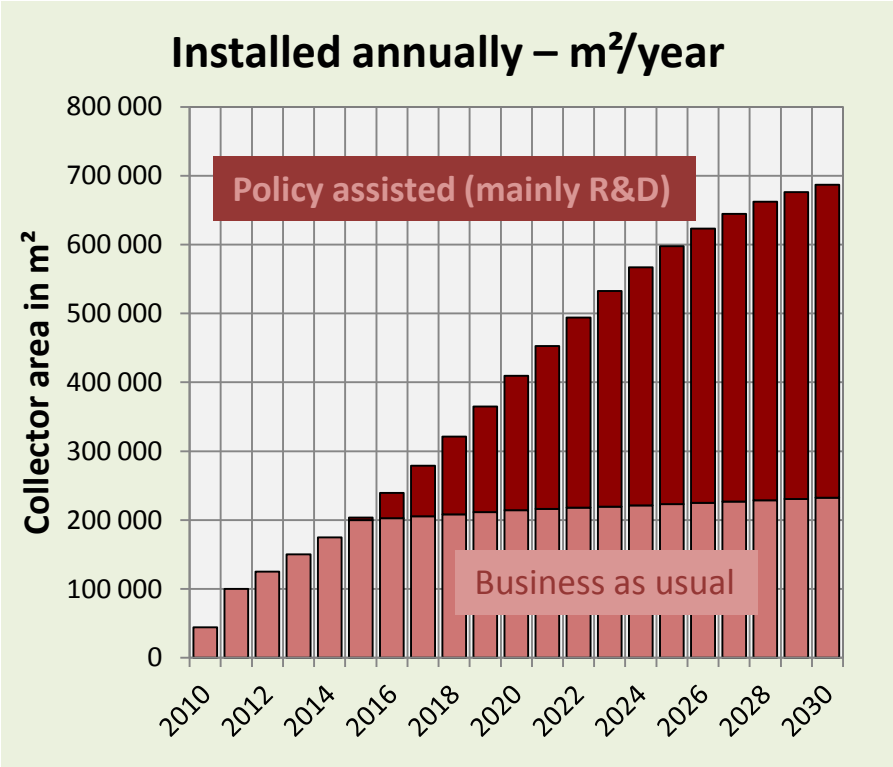


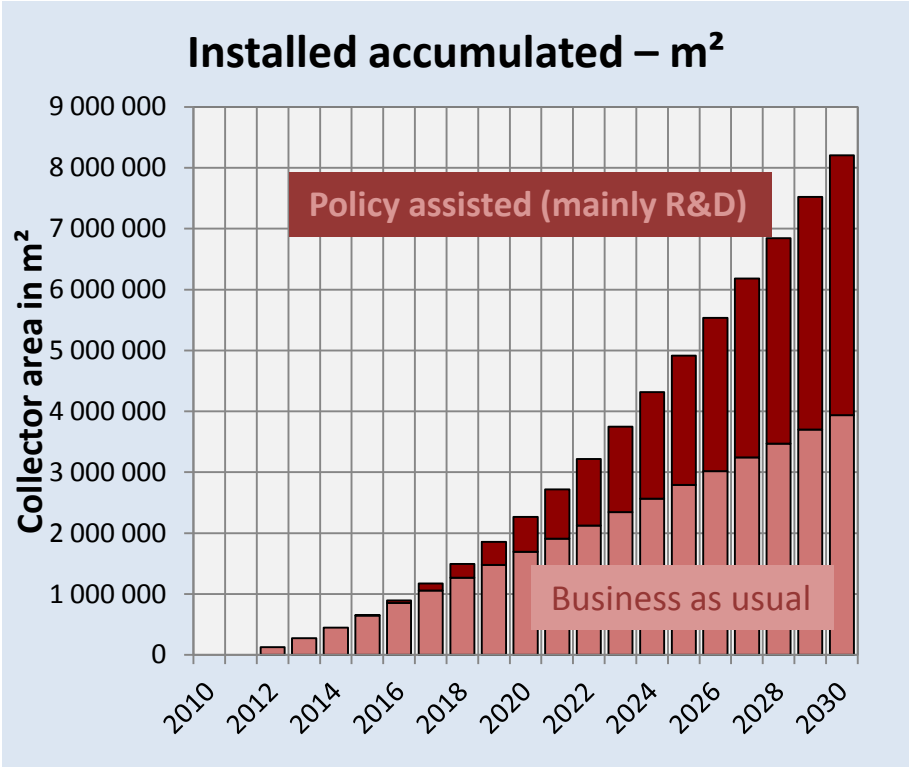
News: Braedstrup extension

- + 12.600 m²
- borehole heat storage
- heat pump



NEW Danish Solar Thermal Action Plan





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Thank you for your attention

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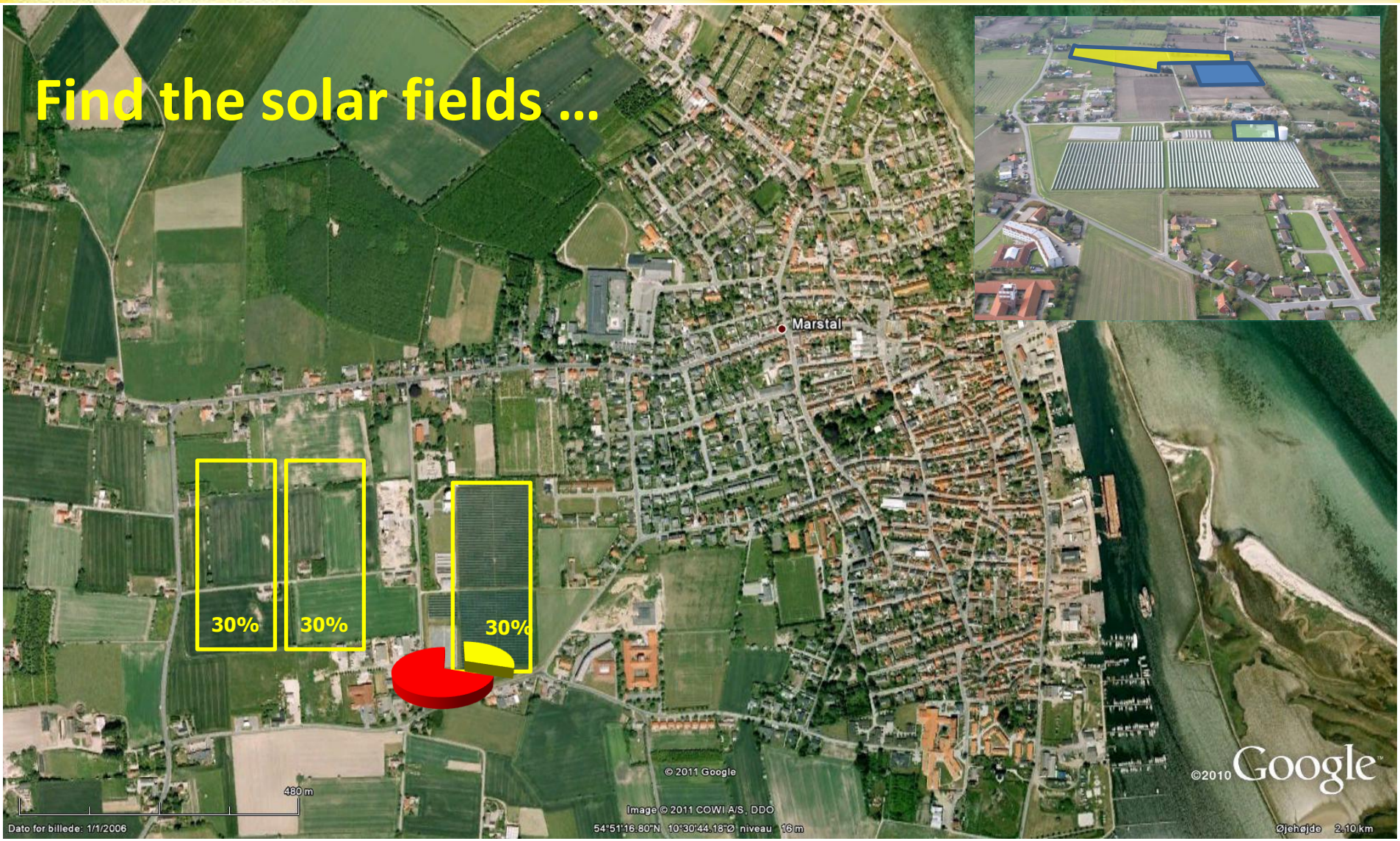
Find the solar fields …