APPENDIX C: EXAMPLE OF DOCUMENTED ENERGY SAVINGS UNDER THE DANISH EEOS

New solar heating system in the Danish city of Havdrup

Summary

Rambøll describes and documents below the energy savings that Solrød District Heating has achieved by establishing the Havdrup solar heating plant in 2016. The calculated savings are presented in the following table:

Item	Title	Savings MWh/year
1	Solar heating system	1.203

Documentation

When establishing Havdrup solar heating system, the investor Solrød District Heating Company is credited with the energy savings for calculated annual production from the solar heating system.

The solar heating system's supplier Aalborg CSP has calculated the solar thermal energy produced by the 208 solar collectors in the new solar heating system, corresponding to 2,569 m2. The attached calculation shows an annual production of 1,228 MWh, corresponding to 478 kWh per m2 collector per year. The calculations were carried out in the CalSun calculation program, with weather data from the Danish Meteorological Institute, Danish Reference Year 2012 (DRY2012), on an hourly basis for an entire average year.

In the calculation, it is assumed that the 1st row (+ the displacement corresponding to 2 solar collectors) does not have shade, whereas the others get shade cf. installation angle of 45 degrees. For the piece of land to be utilized optimally, the solar collectors deviate 6 degrees from direct south, and this is also included in the calculations.

The system's solar collectors and pipe system are designed with low pressure loss in the long rows, and thus the electricity consumption is lower than similar systems. The electricity consumption in the solar heating system therefore does not differ significantly from the electricity consumption Havdrup Varmeværk will save on boiler operation. The total electricity consumption is therefore set equal to 0.

In addition, an internal heat loss in the solar heating system is estimated at 2%. The total annual heat delivery to the district heating system is thus a total of 1,203 MWh. Solrød District Heating can use this as an energy saving quantity within the national EEOS.

Version 1.2

AALBORG CSP
- Changing Energy

Lokation

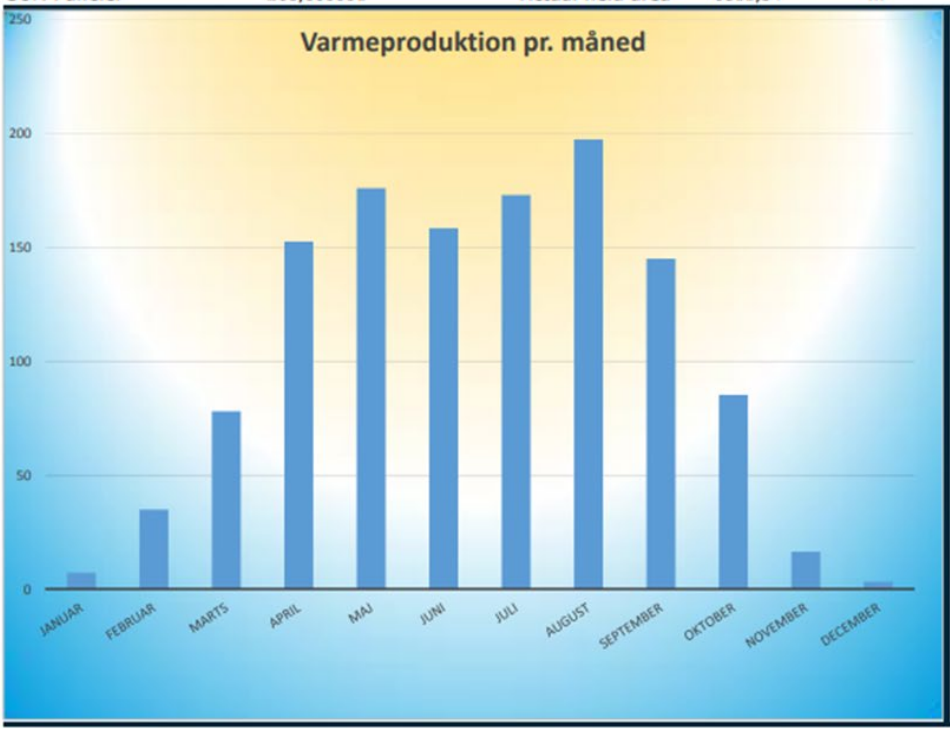
Kunde	Solrød/Havdrup Fjernvarme	
Adresse	Havdrup Alle 4622 Havdrup Danmark	
Sags nummer	2016-688	
Breddegrad	55,5	°N
Længdegrad	12,1	°E
Sol data	DMI Zone 5	
Temperatur data	DMI Zone 4	

Temperatur data

Måned	Retur	Fremløb	Omgivelser
Januar	45,0	50,0	1,0
Februar	45,0	50,0	0,8
Marts	45,0	75,0	-0,1
April	45,0	80,0	7,6
Maj	45,0	80,0	11,8
Juni	45,0	80,0	14,6
Juli	45,0	80,0	18,5
August	45,0	80,0	18,5
September	45,0	80,0	15,3
Oktober	45,0	70,0	10,4
November	45,0	50,0	3,8
December	45,0	50,0	1,2

Panel Type	Rækker	Paneler pr. række	Rækkeafstand	Temperatur	Vinkel	Orientering	Areal
GK 3133 SingleGlazed	9,4545455	11	6	Low	45	6	1284
GK 3133 DoubleGlazed	9,4545455	11	6	High	45	6	1284

SUM Paneler 208,000001 **Actual field area** 6811,54 m^2 **Samlet areal** 2569 m^2



Måned	MWh
Januar	7
Februar	35
Marts	78
April	153
Maj	176
Juni	159
Juli	173
August	197
September	145
Oktober	85
November	16
December	3
Årlig ydelse	1228
kWh/m²/år	478
Max ydelse	11855 kWh
Date	09-05-2016
Peak	1852 kW
Date	09-05-2016
Range of declination	5 %
Nr. Dage/år mellem [%] af peak	10