Market monitoring

Subject:	Market monitoring
Description:	This document describes how the status of SDH markets can be monitored in order to follow the market development.
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Introduction

Where the SDH sector is well established in few areas, the markets are emerging in many other regions. This document describes how the market can be monitored with a simple procedure to be able to keep track of the development. This may be useful when evaluating the impact of different measures, which either facilitate or obstruct the market development (e.g. direct or indirect subsidies), and/or when estimating the future market shares (e.g. to keep track of national energy system transition goals).

The process of gathering market data

For each plant, a minimum of general information is needed (see table 1 below). The gross area should be stated, but also aperture area could be relevant (see section “Example of Denmark” below). It is important to ensure consistency when gathering the data (i.e. to specify the area unit in m^2_{gross} or $m^2_{aperture}$). Specifying when the system is commissioned can be specified as date, month or simply only the year depending on the desired level of detail for future reference.

Market monitoring is done in different geographical levels and can be carried out by means of inputs from various local sources. Input from different SDH stakeholders are in Denmark the key driver. Since the collector manufacturers are interested in promoting their technology, they typically assist with their inputs when asked. In turn, they receive the market status overview when it is completed. Other key stakeholders such as consultants and turn-key contractors also assist with their inputs. Besides this, SDH business related news e.g. in the context of district heating (DH) related news, general energy sector news and regular press) are also used as input for the market analysis. It is recommended that a cross check with the owner of the system is required for all systems before they are included in the statistics. Sometimes SDH projects are announced and then realised with a great delay or not at all. Hence, the commissioning of each system should be

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confirmed by a third party. The data is gathered into a national market survey at least annually (in Denmark it has been done 2-4 times a year due to a significant development during the latest years.)

This feeds into a European database which may also have its own sources of information (that can be cross-checked with the national data). All this again feeds into the official world statistics of solar thermal installations [1]. It can also be relevant to include the type of collector for each system since this could affect which data is included in other statistics. As an example, concentrating collectors are presently not part of Solar Heat Worldwide national market statistics [2].

Table 1. Example of information needed to be filled in as a minimum description of the SDH system

Country	City/Town	In case of extension of existing system, extension no.	Collector field area [m²]	Collector area given (choose)		Thermal capacity [kW]	Start date of operation
				Gross area			
				Aperture area			

Other relevant information could also be included such as

- owner of the system
- collector brand, type(s) and/or specific model(s)
- annual solar energy production [MWh] – possibly incl. approximate period of measurements (years)
- annual solar energy supply to DH [MWh] – possibly incl. approximate period of measurements (years)
- type of associated storage (diurnal/seasonal/none) – possibly with specific type and/or volume
- any additional notes or special features of the given system e.g.
    - associated DH production units
    - mounting (ground/roof/…)
    - investment costs
- source of the information

Requirements for the SDH systems to be included

Two main points need to be considered for every SDH system before they should be included in any SDH statistics: First, does the system fall under the definition of a *solar district heating* system? Secondly, does it meet the minimum size requirement? For the latter point, there is no general standard for minimum sizes. In case the aim is to monitor the market of large-scale systems only, a suitable threshold could be 0.7 MW_{th}

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corresponding to 1,000 m² according to [3][1]. Regarding the first criterion, the definition could be phrased as follows:

> *A solar district heating system is defined as any solar thermal system able to supply all or some of its generated solar heat into a district heating network – directly, via some form of storage and/or via a combined heat and power process.*

It is recommended to have well-defined criteria to know in all cases if a system should be included in the statistics or not. The reason why combined heat and power is mentioned in the definition above, is that a solar thermal system could be based on concentrating collectors which supplies heat to a solar (electric) power production, and in connection to this process, the excess heat is fed into a DH system. The purpose could in that case be combined solar heat and power. With the definition above that kind of system would be considered SDH. Another concept – which would also be considered SDH with the definition above – could be in case a solar heating system is mainly established to supply an industrial process, but *also* feeds a share of its solar heat to a DH network.

In contrast to these examples, a case of an industrial process supplied with solar heat where the excess heat from that process is fed into a DH network (with no direct connection to the solar heat production) would *not* be considered SDH, but rather SHIP[2] combined with utilisation of industrial excess heat.

Example of Denmark

Based on the principles above, the data for Denmark is gathered in a list as seen below in table 2. This includes the name to identify the system (typically the name of the town in which the DH network is located), the collector area and the corresponding thermal capacity. For historical reasons, the list indicates *aperture area*, but as the latest standard [4] dictates, the gross area should be used in the future. A benefit of this change is that it makes it easier to compare collector areas of evacuated tubular collectors with flat plate collectors.

The list in table 2 indicates both installed capacity, which is still in operation (referred to as ”in operation”), and the expected, upcoming installations, which are stated as a project in process (”planned”). The latter does not mean that the system is in the construction phase, and it happens that some of these are for some reason cancelled before they are realised. The systems indicated as ”planned” are simply projects far enough in the process, that a decision has been made to realise it. Typically, at least the permissions from authorities have been granted. A system stay indicated as ”planned” until it is up and running. Only then it is moved to the top list (”in operation”). Often some adjustment in the collector area needs to be made, because the initial

[1] Using 1 m² (aperture) = 0.7 kW_{th}.
[2] SHIP = Solar Heat for Industrial Process.

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estimated collector area is often given as rough numbers in thousands of m^2 whereas the final number should be the exact area.

Note that the market monitoring should include realised systems as a minimum and that this data represents the actual statistics. The possibility (optional) of adding a list of "planned" systems (incl. its unavoidable uncertainty) is a way to get a feeling of the development forward in time instead of only backwards.

In the Danish example, only systems with a collector area above 1,000 m^2 are included. One could argue that even smaller systems e.g. down to 500 kW_{th} (~714 m^2) or 350 kW_{th} (500 m^2). However, since most SDH systems in Denmark are anyway above 1,000 m^2, such a change has presently (by 2017) not been made.

When gathering the market data, it is relevant to distinguish between new systems and extensions of existing systems. In table 2 below, this is indicated by stating "stage x" at systems with one or more extensions. This makes is possible also to follow the number of systems, number of new systems and derive the average size per (S)DH plant.

Table 2. Example of the list of systems in Denmark

Danish solar district heating plants - existing and upcoming			
2017 (ultimo)	Year	Collector area	Capacity
		[m^2]	[MW_{th}]
In operation			
Saltum	1988	1,005	0.7
Ry	1990	3,025	2.1
Herlev	1990	1,025	0.7
Marstal, stage 1A	1996	8,038	5.6
Ærøskøbing, stage 1	1998	2,040	1.4
Marstal, stage 1B	1999	1,005	0.7
Ærøskøbing, stage 2	2000	2,860	2.0
Nordby	2001	2,500	1.8
Rise	2001	3,750	2.6
Marstal, stage 2	2003	9,322	6.5
Ulsted	2006	5,012	3.5
Brædstrup, stage 1	2007	8,012	5.6
Strandby	2008	8,019	5.6
Sønderborg, stage 1	2008	5,866	4.1
Hillerød	2008	3,007	2.1
Broager	2009	9,988	7.0
Gram, stage 1	2009	10,073	7.1
Tørring, stage 1	2009	7,284	5.1
Ærøskøbing, stage 3	2010	2,190	1.5
Jægerspris, stage 1	2010	10,000	7.0
Ringkøbing, stage 1	2010	15,000	10.5
Oksbøl, stage 1	2010	10,000	7.0

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Tistrup	2010	5,409	3.8
Hejnsvig, stage 1	2011	3,704	2.6
Sæby	2011	11,921	8.3
Svebølle-Viskinge, stage 1	2011	7,035	4.9
Sydfalster	2011	12,094	8.5
Ejstrupholm	2011	6,243	4.4
Dianalund	2011	2,000	1.4
Vejby-Tisvilde	2012	8,000	5.6
Gørding	2012	7,424	5.2
Skovlund	2012	2,970	2.1
Vojens, stage 1	2012	17,500	12.3
Brædstrup, stage 2	2012	10,600	7.4
Skørping, stage 1	2012	2,000	1.4
Feldborg	2012	4,006	2.8
Gråsten	2012	19,024	13.3
Helsinge, stage 1	2012	4,763	3.3
Marstal, stage 3	2012	15,000	10.5
Ørnhøj-Grønbjerg	2012	5,083	3.6
Sønderborg, stage 2	2012	1,815	1.3
Sandved-Tornemark	2012	3,893	2.7
Jægerspris, stage 2	2013	3,405	2.4
Christiansfeld	2013	9,545	6.7
Tarm	2013	18,585	13.0
Toftlund, stage 1	2013	11,000	7.7
Mou	2013	4,737	3.3
Karup	2013	8,000	5.6
Tversted	2013	4,032	2.8
Hvidebæk	2013	12,038	8.4
Frederiks	2013	8,438	5.9
Tim	2013	4,235	3.0
Sydlangeland	2013	12,500	8.8
Sig	2013	3,479	2.4
Oksbøl, stage 2	2013	4,745	3.3
Hejnsvig, stage 2	2013	2,063	1.4
Dronninglund	2014	37,573	26.3
Ringkøbing, stage 2	2014	15,000	10.5
Flauenskjold	2014	2,963	2.1
Grenaa	2014	12,096	8.5
Løgstør	2014	15,208	10.6
Nykøbing Sjælland	2014	20,084	14.1
Asaa	2014	5,650	4.0
Gl. Rye	2014	2,444	1.7
Isenvad	2014	3,000	2.1
Gjerlev	2014	3,528	2.5
Helsinge, stage 2	2014	14,855	10.4
Vildbjerg	2014	21,244	14.9
Svebølle-Viskinge, stage 2	2014	3,000	2.1
Høje Taastrup	2014	3,000	2.1
Hvide Sande	2014	9,576	6.7

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Haderup	2015	4,234	3.0
Skuldelev	2015	3,742	2.6
Vrå	2015	13,200	9.2
Vojens, stage 2	2015	52,492	36.7
Gram, stage 2	2015	34,851	24.4
Snedsted	2015	6,502	4.6
Øster Hurup	2015	3,225	2.3
Taars	2015	10,011	7.0
Skørping, stage 2	2015	5,292	3.7
Løgumkloster, stage 1	2015	9,699	6.8
Jetsmark	2015	15,183	10.6
Kværndrup	2015	6,200	4.3
Hundested	2015	14,465	10.1
Jerslev	2015	4,612	3.2
Aulum	2015	15,889	11.1
Hjallerup	2015	21,546	15.1
Langå	2015	8,505	6.0
Hadsund	2015	20,513	14.4
Als	2016	5,947	4.2
Løgumkloster, stage 2	2016	5,576	3.9
Helsinge, stage 3	2016	3,276	2.3
Egtved	2016	12,000	8.4
Padborg	2016	13,961	9.8
Kølkær	2016	2,873	2.0
Svebølle-Viskinge, stage 3	2016	1,000	0.7
Øster Toreby	2016	20,000	14.0
Stege	2016	14,515	10.2
Holsted	2016	12,500	8.8
Ejsing	2016	1,800	1.3
Løkken	2016	12,096	8.5
Tørring, stage 2	2016	8,467	5.9
Trustrup-Lyngby	2016	7,245	5.1
Tommerup	2016	15,000	10.5
Ørum	2016	6,375	4.5
Løgstrup	2016	7,031	4.9
Haslev	2016	6,010	4.2
Hammershøj	2016	6,000	4.2
Voerså	2016	2,873	2.0
Jelling	2016	15,290	10.7
Veddum-Skelund-Visborg	2016	5,500	3.9
Fuglebjerg	2016	10,584	7.4
Bredsten-Balle	2016	7,800	5.5
Skårup	2016	5,418	3.8
Silkeborg	2016	156,694	109.7
Søllested	2016	4,701	3.3
Hedensted	2016	11,000	7.7
Jyderup	2016	9,239	6.5
Toftlund, stage 2	2016	15,000	10.5
Nykøbing Mors	2016	16,708	11.7

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Gedser	2016	4,000	2.8
Farsø	2016	15,120	10.6
Aalestrup	2016	24,129	16.9
Brønderslev	2016	26,929	18.9
Havdrup	2016	2,569	1.8
Hundested, etape 2	2017	1,411	1.0
Løkken, etape 2	2017	2,822	2.0
Gråsten, stage 2	2017	11,189	7.8
Vivild	2017	6,124	4.3
Øster Brønderslev	2017	4,990	3.5
Total in operation to date:		**1,327,451**	**929.2**
Planned			
Stoholm	2018	12,500	8.8
Grenaa, stage 2	2018	18,000	12.6
Jerslev, stage 2	2018	900	0.6
Aabybro	2018	26,195	18.3
Sønderholm	2018	4,200	2.9
Vrå, stage 2	2018	1,500	1.1
Smørum	2018	11,306	7.9
Kloster	2018	2,300	1.6
Lem	2018	8,140	5.7
Hjallerup, stage 2	2018	4,372	3.1
Høng	2018	18,000	12.6
Hadsten	2018	25,000	17.5
Skovsgård	2018	4,450	3.1
Roslev	2018	8,500	6.0
Ringe	2019	26,000	18.2
Løgstør, stage 2	2019	7,000	4.9
Silkeborg stage 2	2019	15,000	10.5
Durup	2019	5,000	3.5
Ramsing-Lem-Lihme	2019	8,000	5.6
Troldhede	2019	8,000	5.6
Strandby, stage 2	2019+	4,000	2.8
Vojens, stage 3	2019+	5,000	3.5
Haslev, stage 2	2019+	125,000	87.5
Nykøbing Mors, stage 2	2019+	8,000	5.6
Lendemark	2019+	2,900	2.0
Korsør	2019+	12,250	8.6
Total upcoming systems		**371,513**	**260.1**

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References

[1] Global Status Report 2017, page 75-81 and 260-263, www.ren21.net/wp-content/uploads/2017/06/17-8399_GSR_2017_Full_Report_0621_Opt.pdf

[2] IEA SHC Solar Heat Worldwide, www.iea-shc.org/solar-heat-worldwide

[3] IEA SHC conversion method (0.7 kW/m^2 collector), www.iea-shc.org/conversion-method

[4] ISO 9806:2017, Solar energy – Solar thermal collectors – Test methods, September 2017, www.iso.org/standard/67978.html

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