

CURRENT DEVELOPMENTS AND PROSPECTS OF SOLAR DISTRICT HEATING IN EUROPE

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1 Introduction

Solar district heating (SDH) plants are a large-scale solar thermal technology supplying renewable, zero-emission heat from large collector fields via district heating networks to residential and industrial areas.

SDH plants are usually operated by local district heat suppliers. They are the key actors for SDH. Therefore, five national district heating associations (or groups) from Austria, Czech Republic, Denmark, Germany, Italy and the European roof association Euroheat & Power joined with acknowledged experts on the field of SDH for the Intelligent Energy Europe (IEE) project SDHtake-off. The project actions follow a comprehensive approach for a market introduction of SDH, contributing to a development to its full long term potential, which experts estimate at 5 to 10 % of district heat from solar and an annual solar heat production in Europe of 100 to 200 PJ. Solites is initiator and coordinator of the SDHtake-off project.

Long-term research programmes in Sweden, Denmark, Germany and Austria led to SDH demonstration plants, operating today at feasible heat cost. Twenty years of operational experience, plant technology and know-how are available from these programmes. Since the mid of this decade there is an increased interest in the commercial operation of SDH, mainly by utilities but also from local authorities and the housing sector. SDH presently makes the step into the market.

2 Status, prospects and current developments of solar district heating

In Europe, there are about 125 large-scale solar thermal plants in operation with a nominal power above 350 kWth and about 40 plants with a nominal power above 1 MWth (Status 2007, /1/). This corresponds solely to about 1 % of the total installed capacity of solar thermal in Europe. However, about 9 % of the total heat supply in Europe is covered by district heating, which is an enormous potential for the integration of solar heat.

Experts of the European Renewable Heating and Cooling Energy Technology Platform (RHC-ETP) /2/ consider a share of solar thermal in district heating of about 1 % as feasible for the next 10 to 20 years. The long term potential is estimated to 5 to 10 %, which corresponds to an installed solar collector capacity of about 50 to 100 GWth and an annual solar heat production of 100 – 200 PJ/a.

For the so far realised large-scale solar thermal plants different technological approaches have been developed in the involved European countries:

- In Germany eleven solar district heating pilot projects were realised between 1995 and 2009 within the national R&D programmes Solarthermie-2000 und Solarthermie2000plus (total capacity 17.5 MWth). The aims of these activities were the demonstration and advancement of solar heat supply systems, in most cases for residential settlements, including large seasonal heat stores and achieving high solar fractions of 30 to 50 % of the total yearly heat demand. In particular technologies and cost-effectiveness of solar heat stores have been improved and demonstrated in practical realizations. For most of these plants the collector fields are integrated on distributed building roofs.
- In Denmark in most cases large central ground-mounted collector fields are integrated in smaller district heating systems. The total nominal power of the Danish plants amounts at present to 74 MWth.
- In Austria and Sweden large-scale solar thermal plants are often combined with biomass heating plants. At Graz a large-scale solar plant was decentrally connected to the large city district heating grid.

At present Denmark is the front-runner regarding the market introduction of solar district heating. New plants with a total capacity of 40 to 70 MWth are in the pipeline. Due to the favorable Danish market conditions the realization and operation of these plants is economically feasible /3/. In pilot plants CHP is combined with solar thermal and large heat stores.

At present the Danish project partners initiate a new IEA Task ‘Large-Scale Solar Heating and Cooling’ in the frame of the IEA Solar Heating and Cooling Implementing Agreement.

3 New German working group on solar district heating

For Germany a climate-friendly and market-oriented district heat supply is indispensable. Shortage of resources and the high dependency on energy imports initiated a process of rethinking. District heating is a future-oriented technology which is able to bring heat from high-efficiency CHP and in future also from renewable sources at a large scale into areas and cities. This was already recognized by numerous energy suppliers and local politicians, which at local level actively promote a future-oriented, secure, efficient and environment-friendly heat supply. The new German working group on solar district heating wants to support these activities, in order to set-up a network of the relevant market stakeholders and to create a solid information and decision base for them. At present the working group is composed by eight energy supply enterprises and four suppliers of solar thermal equipment. The working group is coordinated by the project partners AGFW and Solites. Regular workshops are organized aiming at an intense information exchange and the removal of market barriers.

The controversy between existing heat supply grids, in particular inner-city grids, operated with high-efficiency CHP heat (e.g. from waste incineration) and additional solar heat, mainly available in periods when already a surplus of heat prevails in the heat supply grids, requires a detailed analysis. In these considerations also the elevated space requirements for large collector fields and stores need to be included.

German energy supply enterprises see the opportunities for solar district heating mainly for new-built stand-alone grids as well as a complimentary component for heat generation systems on the base of biogenic energy sources. For the latter considerable savings could be achieved in the summer period. Beside the security of supply, the long term calculability of the heat generation cost is considered as essential advantage of solar thermal, particularly interesting for innovative contracting business models. Furthermore the energy supply enterprises see advantages in the long term climate- and CO₂-neutral heat generation and the avoidance of complex logistic chains for a large-scale implementation. These aspects gain in importance for future local energy supply concepts.

The German working group shall demonstrate that, for the sake of a future sustainable district heat supply, not a confrontation between CHP and solar thermal is of use, but rather the clear identification of the suitable application cases and the related limits for both technologies.

4 Project Facts

In this project the partners analyze the market conditions and barriers leading to recommendations to policy and support scheme decision makers. District heating experts and industries together at one table with experts and industries of the solar thermal sector elaborate industry standards and guidelines for SDH, necessary for commercial activities on this sector. Capacity on the supply side is built up by training and support structures. Targeted dissemination activities will disseminate the project results in 18 European countries, motivate and support new market actors in more European countries to start activities on this field.

The project duration is three years from July 2009 to June 2012.

European partnership:

- Solites - Steinbeis Research Institute for Solar and Sustainable Thermal Energy Systems (Coordinator, DE),
- AGFW - The German Heat and Power Association (DE),
- Euroheat&Power (BE),
- CIT Energy Management AB (SE),
- AIRU - Associazione Italiana Riscaldamento Urbano (IT),
- Ambiente Italia srl (IT),
- ADHCR - Association for District Heating of the Czech Republic (CZ),
- Cityplan spol s.r.o. (CZ),
- PlanEnergi (DK),
- Marstal Fjernvarme A.m.b.a. (DK),
- SOLID Solar Installation and Design GmbH (AT),
- Energie Graz GmbH & CoKG (AT)



Fig. 1: SDHtake-off project team

The website www.solar-district-heating.eu offers further information on new results, events, contact and cooperation opportunities within the SDHtake-off project.



Fig. 2: Project website www.solar-district-heating.eu

References:

- /1/ Jan-Olof Dalenbäck, Harnessing Solar for District Energy, District Energy, International District Energy Association, 2008
- /2/ Jan-Olof Dalenbäck, SDH Market and Policy Assessment, Presentation at SDHtake-off Meeting, Prague, March 2010
- /3/ Jan Erik Nielsen, Large-scale Solar District Heating in Denmark, Presentation at SDHtake-off Workshop, Prague, March 2010, www.solar-district-heating.eu

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