

energy efficiency  
stable costs  
capacity building  
large-scale  
directives  
renewable  
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**Solar District Heating**  
**from Policy to Market**  
Europe  
subsidies  
financing  
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energy transition  
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# Solar district heating – an essential building block for the energy transition in Europe

District heating and solar thermal play a vital role in the transformation of the heat sector in Europe. District heating is one major approach to improving overall energy efficiency in urban areas and increasing the proportion of renewable heat. Solar thermal energy is a zero-emission renewable resource, available all over Europe and able to deliver heat at stable prices over the long term.

Solar district heating, or SDH for short, is a tried and trusted technology. Researchers and industry professionals have amassed over 20 years' experience in developing, operating and maintaining SDH systems. The last decade has also seen a rising interest in the commercial use of these systems.

So far, 300 plants above 350 kW<sub>th</sub> of capacity have been put into operation in Europe. The market has experienced a boom in Denmark and sound growth in several other places, such as Austria, Germany and Sweden. The total installed capacity amounts to 1100 MW<sub>th</sub> and the mean market growth over the last 5 years was more than 35% annually. Other European countries have begun to follow suit and new markets have started to develop.

The key factors to success are a favourable market environment and effective support measures. As part of SDHp2m, a Horizon 2020 project, regional government officials have been working in cooperation with leaders in science, business and manufacturing to develop and implement comprehensive policies and support programmes for solar district heating. These measures are described in this publication. They are a blueprint, if you will, for the implementation of solar district heating in other regions in Europe.





# The versatility and variety of solar district heating

Solar district heating can provide heat for not only small villages and communities, but also renovated housing stock and newbuilds – and even entire cities.

## City districts

A local network is a good option for heating renovated buildings or new urban districts. Usually, solar thermal contributes up to 20% to total heat supply, although the addition of seasonal storage can increase the solar fraction to as much as 50%. One centralised system based on biomass and 680 m<sup>2</sup> of roof-integrated solar thermal collectors has been installed in Vallda Heberg, a residential area set up in 2013 in Sweden.



Vallda Heberg, Sweden

## Rural communities

SDH systems delivering heat to towns and communities in the countryside allow for a fast and comprehensive transition to local renewable resources. In Büsingen, a 1090 m<sup>2</sup> collector system provides the entire heat load for 100 buildings in summer, preventing the uneconomical operation of a biomass boiler. This district heating network has been in use since 2013.



Büsingén, Germany

## Urban areas and cities

Large urban district heating networks typically source thermal energy from combined heat and power systems, heating plants or industrial waste heat. Provided that sufficient area is available, the decentralised arrangement of these large-scale solar thermal installations is one possibility for increasing the proportion of renewable energy in district heating. For example, in Graz, more than 16 500 m<sup>2</sup> of solar thermal collectors feed heat into the city's district network and subsystems at several locations.



Graz, Austria

## Smart district heating

Large solar plants can also be combined with other technologies for heat and power production. Denmark has several smart district heating plants. One of them has been installed in Gram and is equipped with 44 800 m<sup>2</sup> of solar thermal collectors, a heat pump, gas-fired CHP units, an electrode boiler and backup fossil fuel boilers. The plant's pit thermal energy storage measuring 122 000 m<sup>3</sup> allows for flexibility in the use of these energy generation technologies to offset power price fluctuations.

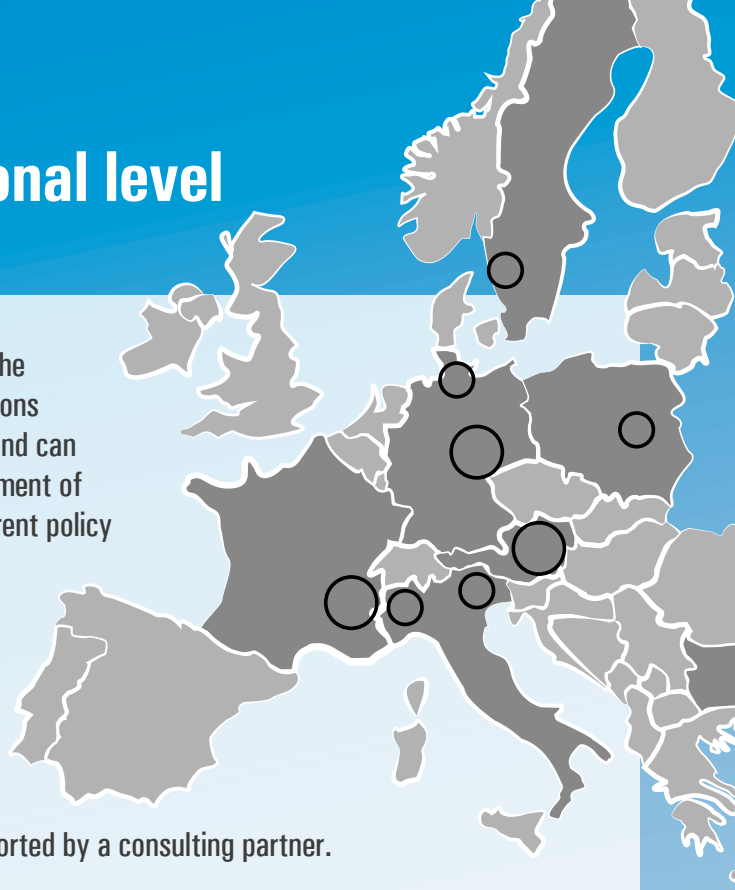


Gram, Denmark

# Common challenges at regional level

Regional governments are the perfect candidates to support the deployment of solar and renewable district heating. Most regions have competences that smaller communities do not possess and can reach a direct impact on the local markets. The direct involvement of regional authorities facilitates interaction and ensures a coherent policy framework. It is they who will lead the way.

SDHp2m has been joined by the governments of the main target regions, which are Thuringia in Germany, Styria in Austria and Auvergne-Rhône-Alpes in France. In six follower regions – Varna, Bulgaria; Hamburg, Germany; Aosta Valley and Veneto, Italy; Mazowsze, Poland; Västra Götaland, Sweden – regional administrations are supported by a consulting partner.



Anton Lang – Styria's councillor for environment and sustainability

## Styria region – a leader in the integration of solar thermal into rural and urban district heating

*"The European Union's climate protection goals require a steadfast shift from fossil energy to renewables. Solar is the one renewable source that offers nearly inexhaustible energy reserves. The use of sunlight in solar thermal systems is a very efficient process, and district heating can ensure their broad implementation. It is the reason why Styria supports solar district heating in any way it can."*

**Regions face common challenges regarding heat supply and solar thermal is the ideal solution to meet these challenges.**

### Introducing renewables and flexible operation to district heat generation

In most European countries, falling and fluctuating power prices have led to shorter operating periods for cogeneration plants, currently the backbone of district heat production. Solar thermal is the ideal solution for closing the gap in heat supply, and storage systems bring flexibility to the entire network. For example, the Big Solar project in Graz will provide a 20% solar thermal contribution to the city's district heating network and ensure sustainable heat supply in the future.

### Available land

On one acre of land, solar thermal can produce up to 2 GWh heat each year. It is the most efficient means to generate renewable heat in terms of land required. Developers, however, need to find areas close to district heating networks. Most regions are tackling the issue head-on. For instance, the Styria region in Austria has created an internal task force to come up with solutions. The subject was also picked up by the region's planning department. Hamburg, on the other hand, has created a guidebook for developing land areas for SDH.



# Innovative policies & financing

The success in Denmark and Sweden shows that suitable policies and market environments as well as access to financing can support the wide-ranging introduction of renewable district heating and cooling. What is needed is an integrated approach addressing the policies, regulations, financing and market barriers across the regions of Europe to create favourable conditions for renewables in general and for the large-scale deployment of solar district heating in particular.

Success factors are:

- Coherent regional policies for renewable district heating and cooling
- Efficient and effective regulations and permit procedures
- Access to financing and subsidy schemes
- Innovative business models

## Regulatory and financial support in Thuringia

*"The draft of the first Climate Law for the federal states in the east of Germany is certainly a step in the right direction and it could also become the driver of Thuringia's transition to energy-efficient renewable heat technologies, such as solar thermal. We have started a broad public debate about an Integrated Energy and Climate Strategy, to propose concrete plans for meeting regional climate protection targets. Renewable district heating will have a vital role to play in this."*



Anja Siegesmund –  
Thuringia's environment  
minister

To encourage the growth of Thuringia's emerging SDH market, stakeholders and businesses have received political, financial and informational support.

- The state's Green Invest programme offers financial assistance for consulting services, feasibility studies and showcase projects on heating networks and renewable energies.
- Thuringia's Energy and GreenTech Agency, a regional consultancy, helps municipalities develop energy management and renewable energy action plans.
- The brochure "The Sun is the Future!" answers questions from stakeholders and provides solutions for SDH implementation.



# Successful market support

Market support and capacity building measures bridge the gap between policy and market. They need to involve all stakeholder groups: Firstly regulators and policymakers, such as regional authorities, municipalities and financial institutions, and secondly market stakeholders, mainly district heating operators and engineering consultants, energy cooperatives and initiatives, experts in heat management and consumer organisations. Analysing the market and speaking to, advising and supporting investors are suitable methods to advance the rollout of SDH on regional markets.



Eric Fournier – vice president for environment, sustainable development, energy and regional parks in Auvergne-Rhône-Alpes

## Auvergne-Rhône-Alpes region: We know our stakeholders' needs

*"In the initial stage of the project, we identified stakeholder requirements in policy and planning, communication, technology and SDH costing. To meet those needs, we have devised a strategic action plan, which was drafted in collaboration with stakeholders and will be managed in partnership with the Regional Energy and Environment Agency and the National Solar Energy Institute. The current case studies on three district heating networks have prompted great interest in the subject and could lead to new capacities. Of course, first and foremost, we expect the project to increase the number of DHC installations, including solar thermal, in the Auvergne-Rhône-Alpes region."*

## How to support SDH market adoption



French stakeholders visiting plants in Germany

- Site visits to SDH plants: Nothing is more persuasive than a tour to a plant and conversations with mayors, operators and citizens in an SDH community.
- Capacity building: Workshops, training sessions and guidelines translate experience and operational data into a knowledge base for long-term use by market stakeholders.
- Feasibility studies: Analysing real-world cases is a powerful tool to develop the sector. It gives businesses something to work with and demonstrates the economic feasibility of SDH in a region.
- Communication: Talking to citizens and interest groups creates sustained public acceptance of renewable district heating and strengthens consumer participation.



## Take advantage of available expertise

Even though local conditions may vary, Europe's regions often face the same challenges in transforming their heat sectors. A look at solutions implemented elsewhere can be a good starting point for further inspiration.

The project has prompted intensive cooperation between several EU regions and a fruitful exchange of ideas. Denmark, Europe's leading SDH market, is participating in SDHp2m to provide know-how and training. Shared challenges were identified, and all regions benefited from the exchange of expertise and the opportunity to learn what has been achieved so far.



Stakeholder group meeting in Bulgaria

## Fully renewable district heating based on biomass and solar – a global solution?

The aim may be to improve air quality, save precious local biomass resources or enhance network efficiency.

Two regions – Aosta Valley in Italy and Västra Götaland in Sweden – decided to promote a model that is well-established in Austria: solar heat in summer, biomass in winter. This combination provides fully renewable energy for currently operating and newly built district heating systems while reducing costs, land requirements and resource use.

To attract a group of biomass district heating operators, Västra Götaland built an entire process chain around the idea of inviting public tenders for solar thermal plants.



Solar and biomass DH in Eibiswald, Austria



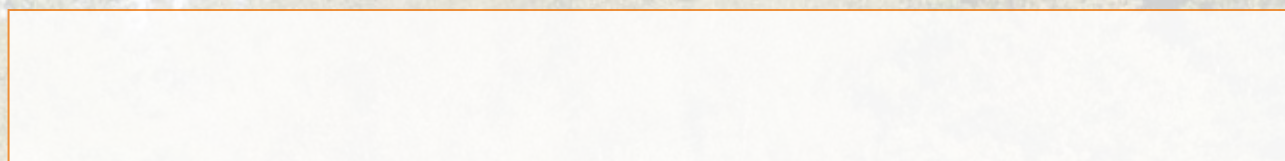
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