SDHp2m

… from policy to market

Advanced policies and market support measures for mobilizing solar district heating investments in European target regions and countries

SUMMARY REPORT

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1. Summary

SDHp2m stands for **S**olar **D**istrict **H**eating (SDH) and actions from **p**olicy **to m**arket. The project addressed market uptake challenges for a wider use of district heating and cooling systems with high shares of renewable heat sources, specifically the action focuses on the use of large-scale solar thermal plants combined with other renewable sources in district heating and cooling systems.

The key approach of the project was to develop, improve and implement advanced policies and support measures for SDH in 9 participating European regions. In 3 focus regions with high potential the regulating regional authorities were participating as project partners in order to ensure a strong implementation capacity within the project. In 6 follower regions the regulating authorities were engaged through letters of commitment and cooperated with experienced consultant partners. The project activities aimed at a direct mobilization of investments in SDH and hence a significant market rollout due to an improved policy, regulation and financing framework backed with embedded efficient market support and capacity building measures.

The project work program in the participating regions followed a process including 1) strategy and action planning based on a survey, best practices and local stakeholder consultation, 2) an implementation phase starting already at an early stage of the project and 3) efficient communication and dissemination of the project results at national and international level.

Nine European regions participated in the *SDHp2m* project at different levels:

A-regions: 3 regions with high potential and with the regulating authority as project partner. In these regions the project was implemented in an intense and comprehensive way.

- Thuringia (DE) represented by Thuringian Ministry for the Environment Energy and Nature Protection
- Styria (AT) represented by Styrian Department of Energy, Housing and Technologies
- Auvergne-Rhône-Alpes ARA (FR) represented by Regional Council of Rhône-Alpes as affiliated partner of the regional agency Association Rhonalpenergie-Environment

B-regions: 6 regions with good potential or also newcomers. One consultant partner per region participated in the project. The regional regulating authorities were involved through letters of support (LOS). B- regions were:

- Hamburg (DE, federal state) with a LOS of Authority for Urban Development and Environment
- Västra Götaland (SE) with a LOS of the Environmental Director of the region Västra Götaland
- Valle d'Aosta and Veneto (IT) with LOS of the regional development agency and the government, respectively
- Varna (BG) with LOS of the Mayor of Varna and the association of Energy Cities, as regulating power is on municipal level in BG
- Masovian (PL) with LOS of the Deputy Mayor of Warsaw (capital of Masovian)

Of these regions Valle d'Aosta, Veneto, Varna and Masovian were newcomer regions.

Figure 1: SDHp2m project team

In the initial project phase, detailed strategies and action plans were developed in all regions based on surveys of the starting situation and an opinion poll. Already at this early stage, nine regional stakeholder groups were set-up as permanent structures and involved through a communication process and meetings, in order to support the project implementation from a practical side. The stakeholder groups remained active in all project phases, they took part in the international cooperation activities and, in several cases, they could be institutionalized.

A transnational coaching scheme was another important supporting element to the project, especially for newcomer regions. In total, 47 coaching missions took place including e.g. webinars, bilateral web meetings and workshops, delegation travels or planning support.

Based on their action plans, the regional teams developed instruments and measures in three main fields: 1) improvement of regional policy and the legal framework, 2) access to financing and 3) market support. In these fields, the regional teams defined in total 43 measures and started their implementation. Selected examples of such measures are:

- The regional team Styria set-up a “Taskforce land availability” in order to simplify the availability of area for large-scale solar thermal plants and to make available a method for their identification.
- The regional team Auvergne-Rhône-Alpes organized networking with local authorities, in particular sustainable energy communities, and developed a communication guideline for them.
- The regional team Thuringia included SDH into the existing regional incentive programmes “GreenInvest”, “SolarInvest” and created a new incentive line for DH systems in rural areas.

In the nine regions, 14 workshops were organized in order to inform stakeholders about these measures, build-up capacity and support implementation.

In order to address the specific target groups in other European regions and countries, the project partners carried out numerous communication and dissemination activities, such as presentations at international events, trade fair participations, regular newsletters and publications. Furthermore, the regional teams presented their activities and know-how in brochures, but also in concise fact-sheets which were translated to other EU languages and made available in a well frequented SDH knowledge data base. A highlight were the two editions of the International SDH Conference held in Billund (DK) and Graz (AT) with in total more than 500 participants from 33 countries.

With these actions, the SDHp2m project achieved a relevant impact both, in the regions covered by the project, but also in the EU DHC sector as a whole. The majority of project performance indicators

were met or outmatched. New market activities, in terms of new SDH installed capacity, are very heterogeneous in the regions. However, even outside Denmark as an exceptional frontrunner country, market actors installed 36 MW_{th} plant capacity during the project lifetime and around 300 MW_{th} are in planning at project end. In general it can be stated, that SDH became much more known in the DHC sector and that the gap between the sectors of solar thermal and DHC could be bridged. In addition the specific approach of the SDHp2m regions could be successfully transferred and led to replication in 10 cases. In France for example, the national energy agency ADEME could be involved in the project, which supported the transfer of project results to other French regions.

A key lesson learned is, that, although the main legislative power is often assigned to the state governments, regional authorities do have a relevant range of action regarding regulations, authorization procedures and the framework for municipalities. Regions have a relevant size, but are still sufficiently close to the market actors and municipalities. It is in particular efficient to link to existing processes and structures and use them for supporting RES DH. Good examples for such approaches are presented in the specific SDHp2m reports. The direct involvement of regional authorities as project partners of the SDHp2m project made the difference.

2. Activities in Thuringia (DE)

2.1 Starting situation

The results of the global climate change, which are becoming visible at international and national level already, are threatening our environment. To counteract, Thuringia may contribute to the international stated climate protection targets at local level. This is why Thuringia is on its way to the Thuringian Climate Law, which states again concrete climate protection targets. To reach these targets, Thuringia is fostering not only an energy transition, but a heat transition with focus on solar district heating amongst other efficient technologies and renewable energies.

The regional heat supply system in Thuringia is rather heterogeneous and dominated amongst by natural gas and oil boilers also by district heating systems. About 21.5% of district heating is from renewable energies, basically from biomass, which potentials in Thuringia are nearly exploited.

Due to this, and Thuringia's settlement structure with lots of rural areas, combining biomass and solar thermal in district heating systems could be one promising approach to increase the share of renewable energies within the heating sector. Furthermore, Thuringia's cities have a high share of multiple dwelling units, which often are either already connected to the cities district heating grid, or could possibly get connected to a local grid, integrating solar thermal collectors on their roof areas.

Figure 2: Thuringia in Germany - source: https://en.wikipedia.org/wiki/Thuringia#/media/File:Deutschland_Lage_von_Th%C3%BCringen.svg

2.2 Regional stakeholder advisory groups

Based on pre-works within the framework of the Thuringian Solar Thermal Initiative, a regional stakeholder advisory group was founded. Its main focus was on advice for the TMUEN concerning the development and establishment of solar district heating policy and market support measures as well as on dissemination of activities and working results.

This group is basically composed by regional key stakeholders such as representatives of municipalities, regional energy suppliers, research institutions, energy cooperatives and initiatives, housing industry, the Thuringian Energy and GreenTech Agency (ThEGA), the Association of Municipal Companies (VKU) and the Chamber of Industry and Commerce of Thuringia (IHK).

Figure 3: 5th meeting of the regional stakeholder advisory group – source: Maria Ehrich / ThEEN

In sum, there were five meetings of the group, usually on the occasion of other special events. Furthermore, one technical tour to Senftenberg – where currently the largest solar district heating plant in Germany is in operation – was organized in March 2017.

Main focus of the regional stakeholder advisory group was on advice for the TMUEN concerning development of policy and market support measures (e.g. regional survey and action plan, plug-and-play manual, regional heat strategy), but on intense capacity building concerning solar district heating and networking with regional stakeholders as well. As a result, within the last meeting of the group the 'Task Force Heat' was established, that will, led by the Thuringian Renewable Energies Network (ThEEN e.V.), continue to work on the heat transition.

2.3 Overview of policy and market support measures

Thuringia is pursuing a comprehensive heat transition strategy. For this reason, policy and market support measures were developed according to a complementing approach. Key element is the Thuringian Climate Law that will build a strong regulatory framework for any other policy and market support measures, when getting accepted by the State Parliament:

Policy measure 'Thuringian Climate Law': The TMUEN has elaborated a draft of a Thuringian Climate Law that is setting concrete climate protection targets for Thuringia and focusing – amongst others – on the potentials of the heating sector for reaching these targets. RES DH has an essential role in that and key stakeholders will get addressed within the Climate Law. The Draft Law has been accepted by the State Government in 2017 and is currently discussed within the State Parliament that will vote about it (see factsheet).

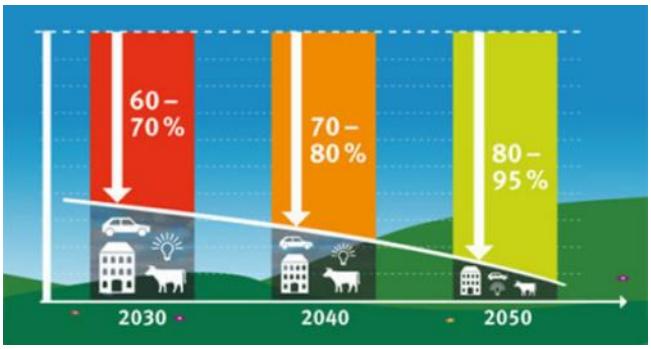

Figure 4: Climate Protection Target set within the Draft Law of the Thuringian Climate Law - source: TMUEN

Policy measure 'Integrated Energy and Climate Strategy (IEKS)': According to the specifications of the Thuringian Climate Law, within a broad public discussion (e.g. workshop series with experts, online dialogue), concrete measures have been elaborated and collected within a 'catalogue of measures' that will help to reach the concrete climate protection target sets within the Climate Law (see factsheet). Furthermore, a Regional Heat Strategy has been elaborated, that will get implemented within this IEKS and set strategic guidelines and fields of actions for further work on heat transition in Thuringia.

Policy measure 'SolarInvest': In Thuringia several funding programs, that complement with other regional and with national funding programs do exist. Within working sessions with different stakeholders, key points for elaborating a concept for revision of the funding program 'SolarInvest' could have been identified. Right now, focus is on investments for photovoltaic plants and energy storages. In the future, the focus will get adapted to funding for project initialization (feasibility studies, house connections, public relations) and investments in heat storages as well. So, the program still will complement with other regional and national funding programs but support regional stakeholders with solar district heating projects (see factsheet).

Market support measure 'Brochure: Future Sun!': A brochure has been printed and published online, that contains a question-answer-catalogue concerning technical, economical, juridical and social aspects of solar district heating. Furthermore it contains three correlating solar district heating case-studies for the cities Erfurt, Sondershausen and Werther (see factsheet).

Market support measure 'Thuringian Solar Calculator': Identifying areas for solar district heating plants is an essential key task in project development. The web-based online-tool has been elaborated to support regional stakeholders with identifying potential areas (any open or roof area in Thuringia) for installing a photovoltaic or solar thermal plant. It provides estimation of solar yield and economy aspects (see factsheet). Furthermore, it is linked to the Solar Service Center at the Thuringian Energy and GreenTech Agency (ThEGA) that is offering practical pre-competitive advice and support concerning district heating projects and solar plants.

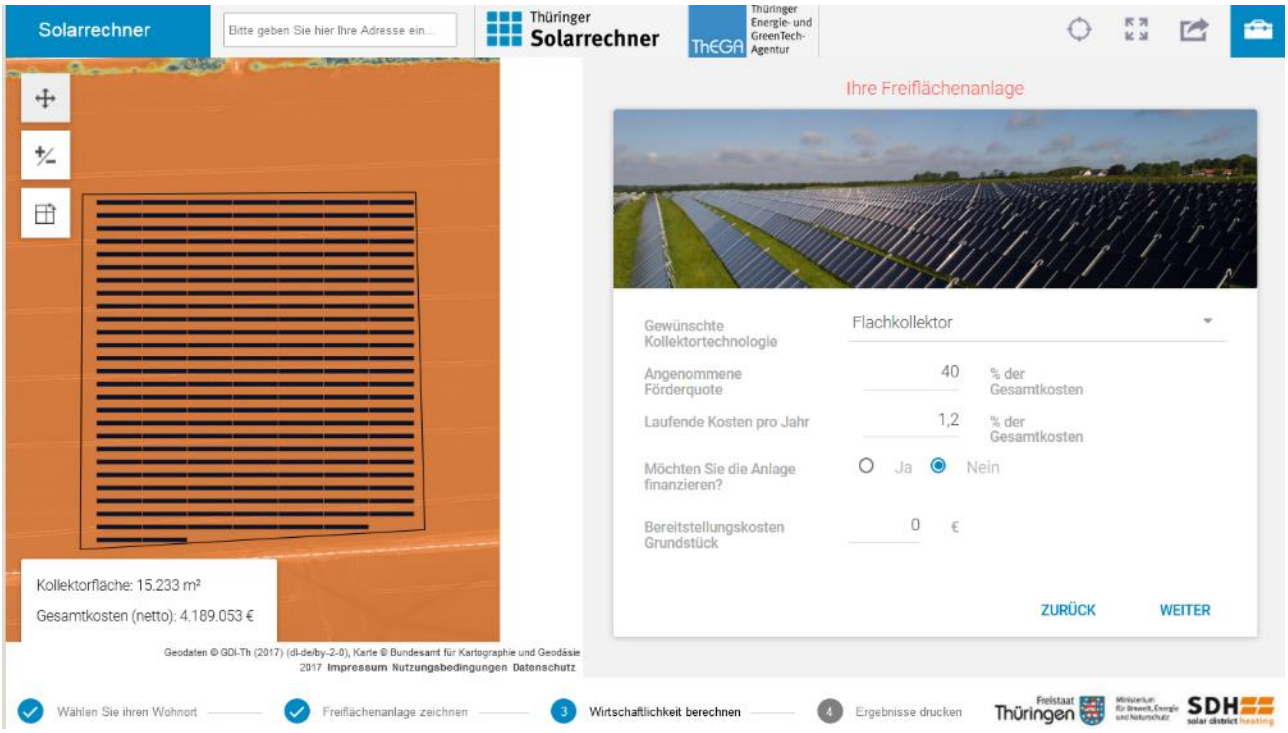

Figure 5: Screenshot of a calculation for a large scale solar plant of the Thuringian Solar Calculator

Market support measure 'tenant heat model': Due to the huge potential of multiple dwelling for the heat transition, the approach of integrating solar thermal plants within the heat supply system of multiple dwelling units was focused. Within working sessions with different stakeholders, the possibilities of integrating solar thermal plants within multiple dwelling with or without district heating have been discussed. As a result, a working paper for further activities of the TMUEN could have been elaborated and be taken into account for revision of the funding program 'SolarInvest' and for further planned events (see factsheet).

2.4 Main events or workshops

Several target group-specific technical tours (e.g. to Senftenberg, Chemnitz and Schaala), working sessions (e.g. for housing cooperatives and regional suppliers) and network events in cooperation with project partners and local institutions (basically ThEGA and ThEEN) were offered in Thuringia. Amongst these events, two main workshops took place, dealing with policy measures on the one hand and market support measures on the other hand:

On 25th of January 2018 a workshop concerning financing and funding of RES DH projects with about 30 participants (basically representatives of regional suppliers, municipalities and energy co-operatives) took place at the TMUEN. Beside presentations concerning the financing of solar district heating plants by the Hamburg Institute, the Thüringer Aufbaubank (TAB) was introducing funding possibilities.

On 15th of October 2018 a workshop concerning technical and organizational aspects of RES DH projects again with about 30 participants (basically representatives of regional suppliers) took place at TMUEN. Key topics were on technical aspects of heat storages, juridical and practical issues of contracting as well as on acceptance for solar district heating projects.

Figure 6: Participants of the technical tour to Schaala (left) and participants of the RES DH financing workshop (right)

2.5 Project results and impact achieved

The SDHp2m-project work has been fulfilled according to an integrated approach. Initial point was the elaboration of the Thuringian Climate Law, whose containing aspects affect on the content of the IEKS and especially the Regional Heat Strategy. Furthermore, there has been an intense discussion and implementation on funding programs (e.g. SolarInvest), whose content complement with the main focus of the policy measures, again. Furthermore, the establishment of the Solar Calculator was an important market support measure. In combination with the Solar Service Center, it builds the starting point for capacity building and project initialization.

All these complementary measures led to an increased interest in SDH as a serious possibility for heat transition in municipalities, energy cooperatives and regional suppliers. Increasing numbers of participants in events and project preparation activities prove this development.

More concrete, in December 2018 the building of the first large-scale solar thermal plant has started. In the northern part of the city of Erfurt an (approximately) 2000m² large solar thermal plant will get into operation in spring 2019 and feed into the existing local grid, operated by the regional supplier.

Two types of solar thermal collectors will be built, since enlargement of this plant may be conducted within the next years and types of collectors should get compared within operation.

2.6 Outlook

All elaborated measures, such as the Climate Law, the IEKS, the Regional Heat Strategy, the funding programs, the Solar Calculator and the Solar Service Centre will persist.

According to the last meeting of the regional stakeholder advisory group, the newly founded 'Task Force Heat' will continue to support the TMUEN with advice for further activities, e.g. the periodic update of the Regional Heat Strategy. Furthermore, several concepts for further target group-specific events could have been elaborated and already in January 2019 a working session – concerning the sustainability of biogas plants and SDH as a possible approach – will take place.

2.7 Project partners and cooperations

Core partners in the Thuringian SDHp2m activities were – amongst regional institutions such as the ThEGA and ThEEN – representatives from regional suppliers, housing cooperatives and municipalities as well as research institutions. Intense project cooperation was with the German project partners, which supported the TMUEN not only in several workshops, working sessions, technical tours and further events but within the elaboration of funding programs and the Regional Heat Strategy.

Regional project partners amongst others:

3. Activities in Styria (AT)

3.1 Starting situation

Styria is one of the nine federal states of the Republic of Austria with the capital Graz. The province of Styria has an area of 16,398 km² and is the second largest province in Austria with 1.2 million inhabitants.

District heating is quite a common technical solution in Austria, and today around 24% of flats are heated by DH. Furthermore, Austria is the European leader in the diffusion per capita of solar thermal technology, with a total of over 5 million square meters, mainly installed in small systems, with an area lower than 20 m².

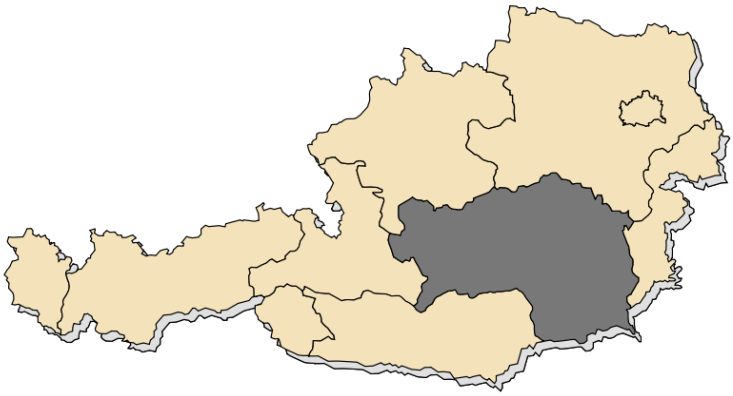

Figure 7: Styria in Austria (source: Lizenz CreativeCommons by Andreas Griessner)

District heating is mainly “on-bill” financed (i.e. by user fees) and partly by different federal subsidies (up to 30% of the investment costs). As far as solar thermal is concerned, different subsidies are available for small and large systems (>100 m²). The larger systems, which could be used in integration with district heating grids, can receive federal subsidies in the range from 10% (small systems) up to 40% of the investment costs (for an innovative solution with area >100 m²).

Regarding the legislative framework, the entire DH sector is not regulated like the electricity or gas branches. DH is generally considered as efficient and clean, and there is no minimum mandatory share for the use of renewables or waste heat in DH production. However, 85% of DH in Austria comes from renewables or recycled heat (CHP, waste incineration, industrial waste heat).

One opportunity for renewable DH in Austria belongs to the positive framework condition of subsidy for innovative solar thermal systems up to 10.000 m². On the other hand, the toughest challenges for SDH in Austria seem to be the low gas price and the scarcity of affordable land areas for collector placing.

3.2 Regional stakeholder advisory groups

The regional stakeholder advisory group, which comprises 15 to 20 people and focuses on the integration of ST in DH, preferably by renewable energies (mostly biomass in Styria), was successfully established by the project. The advisory group is composed of energy suppliers, chambers of different sectors, several departments of the Styrian Regional Authority, Municipalities and energy agencies.

The overall concept of the strategy for SDH development of the advisory group arises from the specific regional conditions: The bigger cities in Styria use DH from waste heat and fossil energy

whereas rural areas prefer biomass as DH energy source. Especially the latter ones offer great potential for the additional integration of solar energy. Therefore the advisory group supports the following key objectives:

- Make SDH more popular especially among users and decision makers.
- Simplify the land availability for the implementation of SDH plants.
- Develop a funding model which also foresees a public participation model.

Figure 8: Members of the Styrian advisory group (1st meeting - excursion to district heating plants in Graz, Puchstraße) (source: AEE INTEC)

In sum, 6 working meetings of the stakeholder advisory group took place. The meetings were usually organized before or after a stakeholder event for SDH. The key topics discussed in the meetings were: The role of DH for the future energy supply (including "KESS", the Climate and Energy Strategy for Styria 2030), the available incentives for large-scale SDH systems, spatial planning and energy in the landscape, the main outcomes from the SDH conferences in Billund and in Graz, the subsidized consulting campaign of the Province of Styria for DH operators, the outcomes of the feasibility studies in Styria for SDH and the ongoing of the advisory group. Three excursions accompanied the meetings. The solar thermal plant which is supporting the main fossil district heating plant Graz Puchstraße, the solar storage project HELIOS in Graz and the solar thermal plant at waterworks Graz-Andritz were visited.

For the members of the advisory group and interested stakeholders, delegation travel was organized from 9th until 10th of May 2017. The delegation travel led to Gothenburg (Sweden) and Denmark, where the solar district system in Dronninglund was visited.

The main results of the Stakeholder Group include intensive work in spatial planning and the creation of its representation for spatial energy planning, as well as the definition of the green zones and agricultural areas for the use of energy supply facilities, such as solar thermal energy. It should be pointed out that the group will continue to meet twice a year in the future so that important topics can be addressed.

3.3 Overview of policy and market support measures

Based on the strategy with five main activities, policy and market support measures were developed according to a well-structured approach. Started implementing the regional climate and energy strategy, the land availability was analyzed in coordination with the spatial energy planning, potential financing models were developed, a subsidy model for feasibility studies was implemented, and the advantages of solar thermal energy in district heating networks were demonstrated at numerous events.

Policy measure 'Energy and Climate Strategy':

The Styrian Climate and Energy Strategy 2030 was adopted in 2017 and contain four packages of measures concerning RES DH. A four-step process has been developed to elaborate concrete actions and implementation plans regarding the packages of measures. The proposed targets, elaborated by the task force, for the action and implementations plans of the packages of measures (E1.3, E2.2, E2.4, E3.3) are summarized in the table below and described in detail in the prepared factsheet. The government will take the official decision of the detailed action and implementations plans in spring 2019 .

Action targets: E1.3 Increase the energy efficiency of local and district heating networks • Promoting efficient district heating expansion • Advice on the optimization of existing district heating networks • Forcing decentralized micro networks with low temperature • Integrating seasonal storage into district heating networks	**Action targets: E3.3 Secure the district heating supply** • Securing the DH supply of Graz in the long-term • Making local and district heating networks fit for the future
Action target: E2.2 Increase the use of solar energy and geothermal and ambient heat • Push the feed-in of solar thermal energy into heating networks	**Action target: E2.4 Optimal use of biomass potential to promote RES DH** • Increase the share of renewable energy sources in district heating networks

Table. 1: Draft of action and implementation plan of Styrian Climate and Energy Strategy regarding RES DH

Policy measure 'Taskforce land availability':

Two concrete measures were implemented: firstly, the **construction of a taskforce** to improve the availability of land for the integration of solar thermal plants and secondly, the **development of a methodology** for selecting the most suitable free areas for solar thermal plants.

The **taskforce land availability** supports the activities to the regional spatial energy planning and identifies opportunities to use free areas ("green zones" and "priority agricultural zones") for efficient local energy supply. To remove the regional mayors from the responsibility for determining the potential utilization of free areas, the proposal was to define the relevant types of utilization of areas in supraregional spatial planning.

A **three-stage concept** was developed for the identification of free areas for solar thermal systems to be subsequently embedded in spatial energy planning. The first stage was carried out for all Styrian municipalities, while the second and third stages were elaborated for two communities during the project period. An implementation to other municipalities is planned (see factsheet).

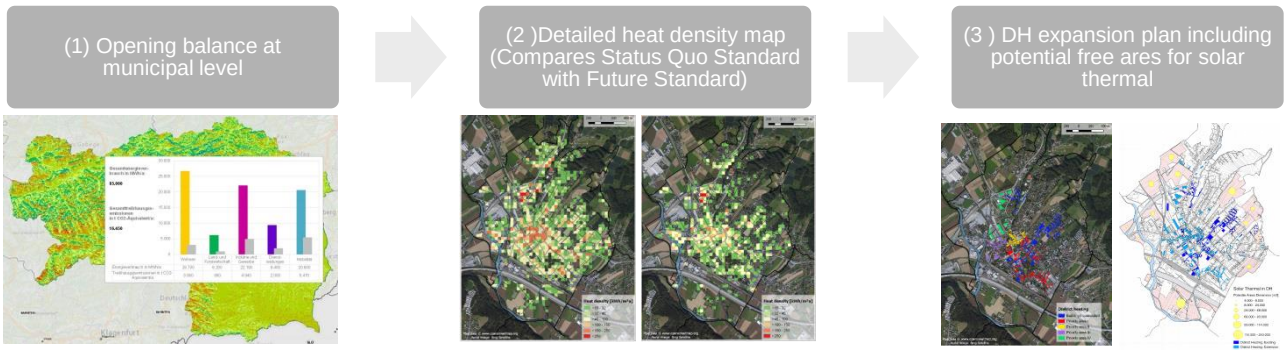

Figure 9: Three-stage concept to identify potential areas for solar thermal in DH

Policy measure 'Financing model for large-scale solar thermal plants':

Together with the national project BeFinSol, a comprehensive guideline for citizen participation models to finance solar thermal systems was developed. The guideline aims to present the possibilities and prerequisites of citizen-financed large-scale solar plants using practical examples. The guideline is addressed to heating plant operators, solar companies, service providers and community representatives in climate and energy model regions and beyond.

The guide describes the different forms of participation with and without voting rights, defines the technical requirements for the integration of a solar thermal system, shows the economic requirements and describes a procedure for selecting the most relevant forms of participation for interested parties. The main differences between the kinds of participation are located in the differences of the participation rights, the risk participation and the type of return distribution. For a broader citizen financing alternative forms of participation (such as loans, bonus models or Sale & Lease Back) are well suited and described in detail in the factsheet "Financing model for large-scale solar thermal plants". (see factsheet and guideline in national language)

Market support measure 'Subsidy Model for RES DH':

A subsidy model concerning a facility check and an onsite analysis for district heating plants based on renewable energies was developed and implemented. Consulting for integration of solar district heating was offered to over 200 district heating operators who are registered with the provincial administration of Styria. Fifteen of these operators were consulted by the SDHp2m project partners AEE INTEC and SOLID. After obtaining relevant information by using a questionnaire, a preliminary design was presented to the district heating operators and afterwards further elaborated, and a report was sent. A cash flow calculation was performed over 15 and 25 years calculation period for obtaining heat generation prices. The resulting heat generation prices, at a calculation period of 25 years, including subsidy, were in the range of 40-50 EUR/MWh. Heat generation prices of the existing systems are in a similar range, but for some operators, calculation time of over 15 years is too long. Thus an additional subsidy, e.g. from the province, would be very desirable. (see factsheet)

Market support measure 'Popularize DH with high shares of RES':

The Styrian guideline concerning the modernization of existing district heating networks was amended: An extension chapter dealing with the integration of solar thermal energy for existing biomass plants was created. The office of the Styrian Government paid this extension, AEE INTEC and SOLID supported this initiative with their expert knowledge. The extension chapter contains 18 pages and describes interactions between solar thermal plants and other parts of district heating systems, success factors, examples of systems and existing reference plants. The guideline is expected to raise the awareness of solar thermal integration among district heating operators in coming years. (see factsheet)

Figure 10: Styrian guideline concerning the modernization of existing district heating networks, (source: Styrian Authority)

3.4 Main events or workshops

Many information workshops and networking workshops for selected target groups (e.g. planners, operators, energy suppliers, and municipalities) were organized. Furthermore, several technical tours to best-practice facilities were organized. Especially, three events for RES in DH were highlighted.

The **5th International Solar District Heating Conference** took place in Graz from 11th to 12th May 2018. Around 350 scientists, representatives from industry, municipalities, energy suppliers and other decision-makers from 33 countries attended the conference. The doubling of the number of participants compared to the conference two years ago demonstrates the great interest in this technology for the decarbonisation of heat networks. The conference topics were able to take a look at how projects can be successfully implemented, and excursions to HELIOS Graz, DH Puchstraße Graz and the biomass DH Eibiswald took place. The latest concepts and developments in the field of solar district heating were presented and underpinned with best-practice examples. The trends and market developments were discussed, and the new generation of district heating was introduced.

Figure 11: Participants of the 5th SDH Conference, (source: AEE INTEC)

On 7th and 8th of June 2018, a capacity building workshop under the title "**Diversification of local and district heating supply**" with a focus on BIG solar concepts and alternative energy sources for local heating networks took place. There were 88 participants including planners, industries, energy suppliers and municipalities. Current practical examples, innovative solutions and news on alternative or supplementary heat sources such as waste heat, waste water heat, ambient heat or BIG-SOLAR concepts were presented. In addition, large-scale storage concepts for the targeted integration of alternative heat sources were discussed. News and developments on subsidies for solar thermal energy and benchmarks also found their place.

Figure 12: Participants of the Symposium "Diversification of local and district heating supply" (source: AEE INTEC)

On 27th of November 2018 a special workshop for municipalities, communities and urban planners under the focus "**Combating climate change with renewable district heating**" took place. There were 45 participants including planners, representatives of municipalities and energy supplier. Requirements of housing promotion and measures of the climate and energy strategy for the integration of RES in DH were discussed. Furthermore, it was presented how municipalities can prepare themselves for spatial energy planning. In addition to the measurement results of realised systems and the planned BIG Solar projects in Styria, the possibilities of funding renewable technologies for municipalities were discussed.

3.5 Project results and impact achieved

Graz, the capital of Styria, is increasingly becoming the flagship city for solar thermal district heating. A milestone has been achieved with the "**Big Solar Graz**" project: The areas for the construction of a large storage tank and the first part of 450,000 square metres of solar collectors are now secured. In future, almost 20% of Graz's district heating can be provided by solar energy. This value is globally unique for a city with almost 300,000 inhabitants.

In addition to the 5.4 MWth solar thermal power plant in Graz, which has been in operation for some time and is the largest in Central Europe, Styria can also present other new reference projects. One is the "**HELIOS Project**" in Graz. It was built on a former domestic waste landfill; three heat sources feed into a large storage tank: a solar thermal system, a power-to-heat module and a cogeneration plant powered by landfill gas. A similar **"Big Solar"** concept was developed for the southeast Styrian district town of **Feldbach** (13,000 inhabitants). The grid temperatures there are considerably lower than in large cities such as Graz, and thus, with a collector area of approx. 50,000 m² and a seasonal storage tank, over 50% solar coverage of the district heating could be achieved. Another new large-scale solar plant with a collector area of 5,000 m² (3,500 kWth) will feed into the **district heating network** of the district town of **Mürzzuschlag** in Styria by summer 2019.

The implementation of **spatial energy planning** and the expansion of renewable district heating was also promoted by the Styrian Authority. New instruments were created for spatial energy planning to implement the heat turnover. This enables the regional authorities to achieve sovereign control concerning the spatial optimisation of the heat supply. In this way, the use of renewable energy potentials, the expansion of heat networks and the coordinated and optimised use of heat supply technologies can be actively promoted, taking local conditions into account.

Furthermore, the guidelines developed in the project support awareness and future implementation of RES in DH. The subsidy model for free consulting and the feasibility studies for heating plant operators also succeed in mobilizing in future investment incentives. The numerous events during the project have also contributed significantly to the current image of SDH and new concepts such as "Big Solar" have resulted. A particular highlight was also the successful hosting of the 5th International Solar District Heating Conference, which achieved an unusually broad impact due to the high number of visitors.

3.6 Outlook

The expansion of renewable energies is an essential component for the future, to provide a climate-friendly energy supply. The aim is to push ahead with subsidy models and legislative proposals for the broad implementation of renewable energies even after the project has been completed.

Among other things, the exchange between the state, funding agencies, industry, interest representatives and research institutions will be pursued further and the stakeholder advisory group "Solar District Heating Styria" will continue to exist even after completion of the project.

Furthermore, two regional follow-up projects are working on RES in DH. A project of the 'model region energy' will deal in detail with the spatial energy planning for the heat transfer. In the project, "Quick BIO-NET", tools should be developed for heating plant operators to show them the potential for changing from fossil district heating to renewable heating.

3.7 Project partners and cooperations

Energie Steiermark

ENERGIE GRAZ

bioenergie

BioEnergie Köflach GmbH

nahwaerme.at

Nahwärme Energiecontracting GmbH

bioenergie-service

Grazer ENERGIEAgentur

Energy Agency of Graz

ENERGIEAGENTUR Steiermark

Energy Agency of Styria

STADT GRAZ

City of Graz

landwirtschaftskammer steiermark

INDUSTRIELLEN VEREINIGUNG

WKO STEIERMARK

AK ARBEITERKAMMER STEIERMARK

zt: ZIVILTECHNIKERINNEN STEIERMARK UND KÄRNTEN

4. Activities in Auvergne-Rhone-Alpes (FR)

4.1 Starting situation

The region covers an area of more than 69 711 km^2, making it the third largest in metropolitan France, with a population of 7 695 264 inhabitants. The Growth Domestic Product represents 230 billion euros and is the 8th European region in term of GDP.

186 DHC are installed in the region and it represents 3 762 TWh of heat delivered per year. 58% of the heat comes from RES, including waste incinerator heat and the 20 biggest DHC represents 75% of the heat supply.

Figure 13: Map of Auvergne-Rhone-Alpes

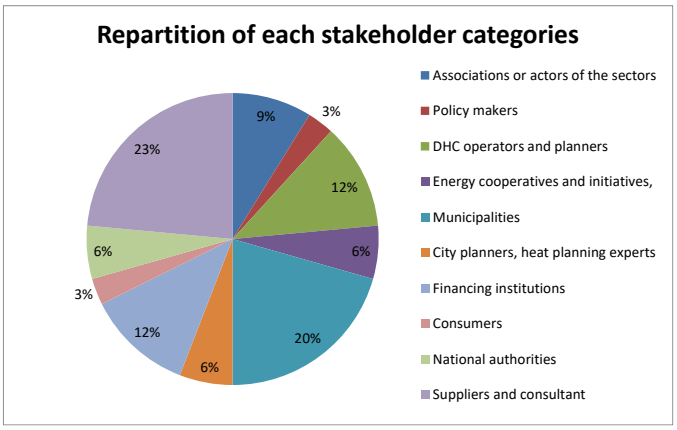

Figure 14: Repartition of each stakeholder category

The initial SWOT analysis carried out highlighted the typical strength of solar thermal (free resource and no-emission "fuel") as well as its opportunities, in line with the current developments in the district heating sector (low temperature systems, long-term storages, energy efficiency, etc.). On the negative side, the main weaknesses are the land occupation factor and the heat regulation for buildings which has not been yet extended to include SDH contribution. Finally, main threat is the competition with many different thermal energy sources: other renewables, cheap waste heat and fossil fuels (especially natural gas, with its quite low prices between 15 and 20 €/MWh)

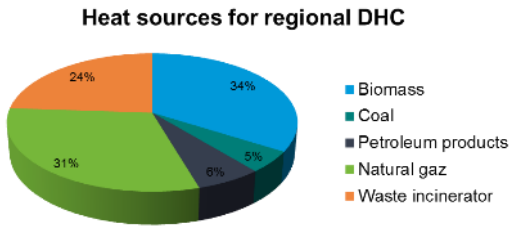

Figure 15: Heat sources for regional DHC

4.2 Regional stakeholder advisory groups

The regional committee was set up since the beginning of the European project and it gathered for the first time in May 2016. This committee is composed by all the public and private actors who are concerned by the subject. Since then, 2 meetings per year allow to present to the participants the project's progress. One meeting was linked to a 2 day delegation travel in Germany to visit SDH installation and to meet regional and local stakeholders.

Figure 16: The Regional stakeholder group during Büsingen SDH visit

4.3 Overview of policy and market support measures

4.3.1 Define a strategy and a regional framework to develop new projects

During the elaboration of the regional scheme on planning, sustainable development and equity between territories (SRADDET) in 2018, SDH was taken into consideration among the development perspectives that could be included in the objectives. A scenario of integration of solar thermal energy in existing district heating and cooling (DHC) systems has been implemented.

The conclusions have shown that 70% of the DHC can integrate a share of solar thermal. Increasing the number of solar panels would allow a rise from 58% to 64% of the renewable energy share in regional DHC. The real potential is on small biomass DHC systems in rural areas. Solar thermal is indeed a solution to remove fossil energy during the summer.

Furthermore, TerriSTORY is a data visualization tool developed by the Regional Energy Agency AURA-EE, with the objective of providing data to the territories. A calculation tool has been integrated in order to modify the energy mix of DHC in territories and integrate a part of solar thermal energy. This tool manages information on local capital expenditure, operational expenditure, generated employment, surfaces of solar panel that are needed etc. It will be accessible for free for all territories and a beta version is available online: https://test.terristory.fr/

4.3.2 Create a regional dynamics based on the network of positive energy territories

The Regional Council launched in 2012 a call for projects named "Positive energy territories" (in French: "Territoires à énergie positive", TEPOS), to encourage territories to produce enough renewable energy to meet their needs by 2050. The Auvergne-Rhône-Alpes Region is the most dynamic at the national level, with 40 territories engaged and a remarkable coordination of key players. Relaying on the TEPOS network allows to improve the knowledge on SDH and to initiate new SDH projects in the Auvergne-Rhône-Alpes Region.

The actions facilitated the communication towards local elected officials on the SDH subject. Sever TEPOS territories were engaged in the regional committee and this way they followed closely the SDHp2m news. If a territory has a suitable project, or an existing district heating network, we support

this local authority to develop new SDH, by providing first technical advices, case studies and economic information on the sector.

4.3.3 Conduct feasibility studies and develop the first references

In the Auvergne-Rhône-Alpes Region, the potential of this sector is important: 400 000 m² to 1 600 000 m² of solar thermal panels could be integrated in DHC systems. Following a call for applications for DHC networks in February 2017, 12 applications were submitted.

In order to study different possible configurations of solar thermal implementation in a DH network, 3 sites were selected as pilot projects:

- The district heating network from Clermont-Ferrand
- The district heating network from Chambéry
- The district heating network from Pelussin

These studies help to provide businesses with information from real cases analysis, in order to demonstrate the economic feasibility of SDH in a region.

In addition to these studies, the project partners were able to support other initiatives through a dedicated resource center. Thus, 7 public authorities were accompanied in their project reflections.

4.3.4 Improve the acceptance of solar thermal in district heating systems

In order to address the challenge an improving acceptance, a guide and a video were created to inform about SDH. The video includes interviews with different stakeholders from the region (local public authorities, energy managers), working to develop these networks. This type of video is initiated for the first time in France and, as a complement for the guide, it will allow to change the public opinion on solar thermal.

4.3.5 Facilitate the capacity building of the sector's stakeholders

In addition to the guides produced and the working groups, specific actions have been taken to facilitate the exchange of information and feedback. All these actions within the SDHp2m project allow the sector's stakeholders to acquire a thorough knowledge on the subject.

Implementation of a toolbox

The French partners of the project highlighted the importance of having a technical and economic database. To answer this need, a toolbox has been created, comprising documents and videos produced within the European projects (SDHp2m and SDHplus) or national projects ("SmartGrid Solaire Thermique"). The digital resources are organized following the 5 important phases of a project: opportunity, feasibility, conception, construction and operation. The toolbox is hosted on the project's website: http://solar-district-heating.eu

Training sessions with international experts

On the 5th and 6th of June 2018, a training session brought together international experts and French actors who initiated the first national projects. Designed for engineering offices and project developers wishing to develop skills on SDH, these two days approached the theme with a high level of technicality, maintaining a very operational approach.

Figure 17: Training session in France

The training addressed technical, administrative and economic issues related to projects, including experience feedback from the Danish, Austrian and French experts and case studies, with a practical application on a calculation tool.

This training was organized with the participation of ADEME, AURA-EE, CEA, INES INDDIGO, PlanEnergi, SOLID and Tecsol. Another session is planned for early 2019.

4.4 Main events or workshops

List of describe your 2-3 main events organized in the region with date and place, title and content, participants (profile and no), results (max 2-3 sentences per event)

Different workshops have been organized during the project. Statistics are presented below

	Number	Number of person	Hours
Regional workshop with local authorities	13	327	38,4
National Workshop with market actors	2	250	1
Regional workshop with market actors	4	92	8,5

A one day full capacity building has been realized the 2nd of February 2017. It gathered around 80 stakeholders from the region. During this conference were presented:

- State of play and perspectives for solar thermal energy development
- Feedback from the 1st french SDH plant
- Presentation of SDH technologies
- Financing solutions for SDH

Figure 18: Capacity building day

4.5 Project results and impact achieved

Among the lessons learnt from the project, there are the following aspects:

- The main barrier to the development of SDH is the poor knowledge of local authorities and stakeholders on this technology.
- The solar thermal solution is not sufficiently studied in the development phase of DH projects.
- Precise technical and economic data, adapted to the territories, is needed.
- Awareness actions for end consumers have to be reinforced.

Facing the challenges identified for SDH projects, but also taking into account the development opportunities, the evolution prospects of the sector can be considered on 3 levels: regional, national and European.

At regional level: opportunities related to the TEPOS network

- The important number of local authorities involved in 100% renewable energy approaches allows to widely spread the information about SDH and its interest (almost 50% of the region is covered by the TEPOS).
- TEPOS territories can be the gateway for reaching other relevant stakeholders (DH operators and planners, local renewable energy producers, etc.).
- If TEPOS territories are convinced on the issue, we could multiply the number of SDH and, consequently, increase the relevance of technical and economic regional data.

At national level: discussions at ministerial level and evolutions of thermal regulation

Discussions are in progress at the ministerial level, thanks to a working group to which the SDHp2m project has contributed. This is the ministerial working group on solar, launched in April 2018 by Sébastien Lecornu, Secretary of State for ecological transition and solidarity. Solar thermal is the subject of a sub-working group, which aims to revitalize the sector and reduce costs, as well as to encourage large-scale projects (on the network, collective and in industry) and the domestic sector.

In thermal regulation, the energy produced by a solar thermal installation on a residential building is not counted in the consumption of the building, which brings an interesting consumption "bonus" for the contracting client. On the other hand, if the same solar installation is connected to a DH network, its production is no longer counted. The interest for the contracting client is thus almost nonexistent, only having the possibility to gain a CO_2 emission class.

A calculation method based on the "energy" and "carbon" criteria was tested until the end of 2018 on new public buildings, as well as on new buildings that have been voluntary. In the long term, these provisions should become mandatory and be included in the next thermal regulation of new buildings and renovated buildings, the "2020 environmental regulation ".

At European level: the importance of environmental policies and cooperation between regions

The successful results in Denmark and Sweden show that environmental policies and support mechanisms allow an efficient implementation of renewable energy in DHC systems. It is necessary to have an integrated approach of the different barriers (political, regulatory, financial, market), across

European regions, in order to create the necessary conditions for the deployment of renewable energies, especially for large plants using solar thermal.

4.6 Outlook

The published guides will be completed and updated in time, taking into consideration the results of the feasibility studies.

Also, the toolbox has to be updated regularly after the SDHp2m project. One of the national associations will be in charge of updating the tools on the website and the information about the French examples of SDH projects.

Visits of the first French installations could be organized, in order to improve the dissemination and knowledge of this way of diversifying DH networks.

To conclude, the SDHp2m project allowed highlighting the success factors for the development of SDH:

- Coherent regional policies for renewable district heating and cooling networks;
- Regulations and procedures should be incentive and efficient;
- The upstream involvement of the concerned actors, and especially of the local officials, who can facilitate the deployment of projects;
- Accessible financing and subsidies;
- Innovative economic models.

4.7 Project partners and cooperations

Different stakeholders were implicated in the SDH p2m projects, especially:

- with local authorities : Chambéry, Clermont Ferrand, SIEL
- with national organizations like ADEME, AMORCE, FNCCR, ENERPLAN
- with market actors like New Heat, Tecsol, Engie, EEPOS, ECHM Veolia

5. Activities in Hamburg (DE)

5.1 Starting situation

The Hamburg Metropolitan Region has 5 million inhabitants, 1.8 million of which live in the central city of Hamburg.

The most important DH grid is the inner city network in Hamburg, which is owned by Vattenfall (majority of shares), and the City of Hamburg. It provides 20% of the heat demand of Hamburg and is among the largest DH networks in Europe. As a result of a referendum in 2013, Hamburg is determined to gain back the full ownership of the DH system in 2019. Outside the city, there are various DH systems running in smaller cities and towns. Most of them are owned and operated by the municipalities or municipally owned companies, only a few systems are run by rural cooperatives.

Figure 19: Administrative districts (Landkreise) of the federal states Hamburg, Schleswig-Holstein, Lower Saxony and Mecklen-burg-West Pomerania in the Hamburg Metropolitan Region (Source: Metropolregion Hamburg).

The main advantages for SDH in the region are several successfully operating SDH pilot projects, high acceptance for RES in general, a strong public financial engagement for SDH with the federal funding scheme and additional local support schemes.

On the other hand, there are a number of barriers left to be overcome as the heating sector in the region is still highly dependent on fossil fuels and the availability of suitable areas to build ground-mounted solar thermal plants is limited due to high real estate prices and competing land uses.

5.2 Regional stakeholder advisory groups

To elaborate and implement a strategy for developing SDH in the region, two already existing permanent working groups were asked to serve as advisory bodies to the project:

The **Working Group on Climate and Energy of the Metropolitan Region Hamburg** is constituted of delegates from the four state governments and from the counties of the Metropolitan region.

The **Heat Forum of the Hamburg Renewable Energy Cluster** (EEHH) involves key stakeholders such as DHC operators and planners, energy cooperatives and initiatives, city planners, heat planning experts, administrations, associations, policy makers.

In sum, there were six meetings with the stakeholder groups – three within regular meetings of the MRH group meeting and three within the regular Forum Heat meeting). Furthermore, one technical tour to Denmark with members of both advisory bodies was organized in April 2016 and a delegation travel to Denmark in May 2017.

Figure 20: The tour to Gram in Denmark, with a focus on large-scale solar thermal solar systems in the context of nature conservation and environmental protection with the stakeholder groups of the Hamburg Metropolitan Region (Source: Hamburg Institut).

5.3 Overview of policy and market support measures

Scarcity of areas is a major barrier to implement SDH in urban areas. The **concept of multi coded areas for SDH** has been developed as a promising approach with a large and diverse potential. A new **best practice guide** points out possibilities to develop SDH areas and double usages of urban areas.

In a case study, the possibility to implement SDH along with urban gardening in “solar neighbourhood greenhouses” has been explored. They provide neighbourhoods with renewable heat and healthy food encourage community building and promote public acceptance. (see factsheet D4.1)

Figure 21: Visualization of solar neighbourhood greenhouses (Source: Hamburg Institut).

Another key activity in the region was the establishment of a dialogue between SDH project developers, nature preservation stakeholders, urban planners and the local administrations. SDH offers the possibility of integrated concepts where heat production goes along with benefits for nature preservation. Federal, state and local politics should strengthen and implement such concepts and stimulate the discussion about a new perspective on landscape integrating energy production. (see factsheet D 3.1)

To transfer the “lessons learnt” from the Hamburg region to others, the instruments to secure land availability for large SDH were also part of the coaching activities with other regions.

5.4 Main events or workshops

On 3rd of April 2017 the conference "Renewable district heating in large cities" was held in Hamburg with around 170 experts and stakeholders on renewable energies in large-scale district heating systems, conducted by the Hamburg Institut in cooperation with the AGFW. Strategies and examples from international and national pioneer cities have shown how the transformation of urban heat supply in the direction of renewable energies succeeds with district heating.

Figure 22: April 2017 conference "Renewable district heating in large cities" in Hamburg (Source: Hamburg Institut).

A capacity-building workshop took place on 28th of March 2018 in Hamburg with the title: “SDH – area competition in urban and rural context / solutions for SDH with nature preservation, agriculture and landscape”. Almost 30 experts with very diverse professional and organizational backgrounds participated in the workshop. For the first time ever in Hamburg, the prospects of the development of SDH projects has been jointly discussed by relevant representatives of farmers, nature conservation authorities, environmental associations and landscape planners.

Figure 23: March 2018 interdisciplinary workshop on areas for SDH in Hamburg (Source: Hamburg Institut).

5.5 Project results and impact achieved

The project has successfully raised the necessary attention at the administrative level on the key aspect of land availability. To promote solutions for SDH and other renewable energies in an environment with high pressure on land use, the Hamburg City administration has created two new jobs within the Ministry for the Environment and Energy (one in the Department of Energy and one in the Department of Landscape planning). The new staff will be able to foster innovative SDH/RES solutions beyond the end of this project. The SDHp2m project contributed to a higher awareness that finding sustainable solutions for the urgently needed areas for the energy transition is important and that the work of the Department of Environment and Energy will highlight these issues in the future.

The SDH project has also helped to trigger new plans for SDH projects. In particular, concepts have been started to develop large SDH on a former harbour sludge dump site, on a sewage water treatment plant and possibly along traffic lines.

Figure 24: potential areas for SDH in Hamburg (Source: Hamburg Port Authority, HSE, IBA Hamburg).

5.6 Outlook

While SDH was not on the agenda in the Hamburg region at the beginning of the project, it now is. It has become normal to consider SDH whenever new settlements are planned. Concrete plans for major SDH developments are on the way. The development of areas for SDH and RES now has a strong institutional and personal basis within the responsible city administration. SDH will be an incremental part of the subsequent introduction of RES into Hamburg's DH system after remunicipalization in 2019.

6.7 Project partners and cooperations

The Hamburg Institut worked close together with the administrations in the MRH and especially in the topic of area competition with the farmer´s associations, NGOs with focus on nature preservation, landscape architects, experts from the HafenCity University and solarthermal collector producer. Very fruitful was the discussion with the new formed federal foundation Competence Centre Nature Preservation and Energy Transition.

Intense project cooperation was with the German and Austrian project partners, which supported in several workshops, conferences and technical tours.

6. Activities in Veneto (IT)

6.1 Starting situation

The district heated volume in Veneto is around 14.4 Mm^3, the grid extension is about 100 kilometers (2.6% of the Italian total extension) and the ratio between this volume and the population is 2.9 m^3 per inhabitant. 7 DH grids are operating in the Region and have been classified as 'not effective' by GSE (www.gse.it) according to the EC Directive 27/2012.

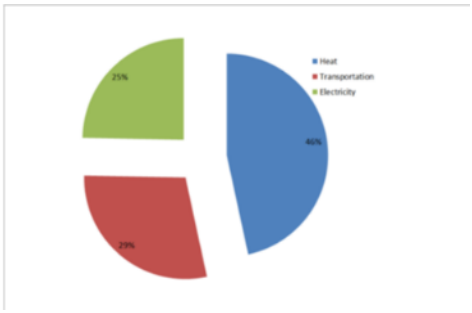

Figure 25: The relevance of the heating sector in Veneto (source: Regional Energy Plan).

Given such a framework, the main opportunity for SDH lie in the need to make the existing DH grids more effective and that biomass cannot be always considered as a valid alternative choice because of the air quality issue and of the complexity of the supply chain.

On the other hand, the natural gas network is widespread in the region and then economic competition with this fossil energy source can be very tough. Furthermore, the region is in a good position with respect to its targets for the national burden sharing and, therefore, this does not represent any push towards a wider use of renewables also in the district heating sector.

6.2 Regional stakeholder advisory groups

At the beginning of the project, the Region Veneto expressed the intention of 'revitalizing' an already existing working group about energy, which had been not operative for a long time. The SDHp2m project, therefore, was a good chance to convey the stakeholders of this group with a specific focus. Unfortunately, then, the energy department of the regional administration underwent a deep refurbishment of the personnel roles and a relevant cut in the staff and, therefore, it was not possible anymore to take operative decisions about the group.

However, relevant regional stakeholders were involved through separate meetings driven by Ambiente Italia with the close cooperation of the Regional Administration through its Department for Energy. Apart from the Regional Administration, it was then possible to consult several stakeholders, above all DH utilities (such as Biomass Green Energy and AGSM), AIEL, the Italian Agro-Energy Association and the Municipality of Feltre.

Thanks to the 4 meetings and webmeetings organized, the main stakeholders' needs and barriers were identified.

6.3 Overview of policy and market support measures

Policy measure 'Integration of SDH plants in district heating networks of large cities'

A study about the solar integration into the DH network in Verona was performed and the results are at the moment under evaluation by the local utility. Even though the availability of areas is not an issue, the very low cost of fossil fuels (namely natural gas because of reduced taxes) is a key barrier for the implementation of SDH (see specific factsheet).

Policy measure 'Authorization procedures for SDH plants'

Due to recent problems with medium and large-scale photovoltaic systems, the visual impact of ground-mounted solar plants is quite a sensitive issue in Italy, at both national and regional level. Within the SDHp2m project, Ambiente Italia trained the Regional Administration through: 1) A summary document on ground-mounted SDH plants, reporting about installation solutions in Austria and Germany, including the possible 'double use' of agricultural land which can still be used for farming; 2) A webinar with Varese Risorse, the utility managing the only SDH plant in Italy, which reported in details the success case of their authorization process (see specific factsheet).

Market measure 'Renewable district heating in small local networks'

Veneto shows a large potential of small DH networks based on the combination of solar thermal and biomass, where the role of solar should be to reduce biomass consumption, thus controlling the air quality issue which is a very sensitive topic in both plain and mountain areas. As lead cases for this market support measure two feasibility studies were performed, one related to a solar integration in an existing biomass DH plant and one for a completely new network designed on the synergic use of solar thermal and wood chips (see specific factsheet).

6.4 Main events or workshops

WP3 workshop – 'Teleriscaldamento a biomasse + solare termico e incentivi comunali alla rottamazione di vecchie stufe e cucine a legna ', Feltre (BL), June 22nd, 2018.

This workshop focused on the possible integration of solar and biomass for small DH networks in mountain areas, such the zone of Feltre, where the event was organized. The main actors cooperating with Ambiente Italia for this workshop were the Municipality of Feltre, AIEL association and the two projects 'Feltre Rinnova' and 'CESBA Alps'. Around 30 participants attended the workshop, mainly professionals and local authorities.

Thanks to the workshop, it was decided to explore the possibility of a solar/biomass grid in Lamen, an area within the municipality of Feltre.

Figure 26: The workshop in Feltre.

WP4 workshop – 'Teleriscaldamento di piccola taglia da solare termico e altre rinnovabili: benefici e opportunità per il Veneto ', Venice (BL), December 15th, 2017.

The workshop, organized by Ambiente Italia together with Region Veneto, was attended by around 30 participants, mainly from utilities and local authorities.

The main outcome of this workshop was the start of a very fruitful cooperation with the Italian biomass association AIEL, which then brought to the development of several project activities.

Figure 27: The workshop in Venice.

Presentation of the results of the feasibility study in Lamen, online webmeeting, December 20th, 2018.

Through an online webmeeting, Ambiente Italia presented to the Municipality of Feltre the results of the feasibility study for a new solar/biomass DH network in the small center of Lamen. This technological option created interest in the Municipality and, therefore, it will be further explored.

6.5 Project results and impact achieved

The first success story to be reported is the numerous and active participation to the workshops: more than **60 local stakeholders** were involved through these events, also raising media attention.

Furthermore, the capacity building workshops set the ground for several follow-up activities (see following points), such as the feasibility studies in Lamen, Polverara and Verona, the technical round table started in Feltre and the co-operation with the Italian biomass association.

3 feasibility studies were carried out within the SDHp2m project covering a wide range of different cases: solar/biomass combination in a new DH network (Lamen, Feltre), solar contribution to lower the summer biomass use in an existing small DH plant (Polverara, Padua) and, finally, solar integration in a large urban network in Verona. Thanks to this activity, the first **3 SDH plants could appear in the region, for more than 4,000 m² of solar collectors**.

Lamen, a small area within the municipal territory of Feltre, could see its future heat supply through a DH network run on local biomass and a 1,400 m² solar thermal system to cover the summer load. The results of the study were recently presented to the Municipality of Feltre which showed to be very interested in this option.

Guerra allo smog: biomasse e solare per riscaldarci

▶Presentato un piano innovativo che integra i due sistemi termici

FELTRE

IL PROGETTO

L'AUTOPRODUZIONE

Figure 28: The workshop in Feltre, reported in a local newspaper

In Polverara, the output of a 220 m^2 solar plant could cover the summer load and improve the environmental performance of the DH network. The study outcomes were already presented to Biomass Green Energy, the local utility, and will be shown also to the local Municipality through a webmeeting in January 2019.

A 2,500 m^2 SDH plant could be installed in Verona: After the presentation of the study to the local utility AGSM, several offers were asked to solar thermal providers and quite good turnkey prices for the plants were obtained. At the moment, the utility is in the decision process.

The last impact to be mentioned is the establishment of a technical round table on local solar/biomass DH, led by Ambiente Italia and the Municipality of Feltre. The activities of this table started with the presentation of the results of the Lamen feasibility study in December 2018 and they will continue with a physical meeting in the first quarter of 2019, also involving the managing authority of the Dolomiti Bellunesi Park, several Municipalities of the territory, professional associations and chambers and the Regional Administration of Veneto.

6.6 Outlook

Figure 29: Polverara: Possible location for the solar collectors.

One of the key topics for the deployment of SDH market in the region is the development of the case studies into real built examples. The three cases described above, in Verona, Polverara and Lamen, could really act as a perfect showcase of the technology also because they cover different situations and market segments, addressing both large urban networks and small local plants.

Furthermore, the technical round table already established in the mountain area of the region, thanks to the close cooperation with the Municipality of Feltre, aims at a wider capacity building of all Municipalities in the area, together with other relevant stakeholders, such as professional, ESCOs, utilities already managing small local networks, etc. This table will be kept alive by Ambiente Italia, hopefully also thanks to another EU-funded project, at the moment under evaluation.

Figure 30: Verona: Slopes around the heating plant

Finally, the cooperation between Ambiente Italia and AIEL, the Italian Agro-Energy Association, will go on also after the end of the project. Promotional activities through common workshops, brochures as well as lobbying activities towards the Regional Administration (for instance for funding of small DH networks) will be developed together. Just to give an example, a presentation by Ambiente Italia on SDH, also including the Lamen case study, was included in a workshop organized by AIEL in the 'Ecohouse' fair on February, 9th 2019.

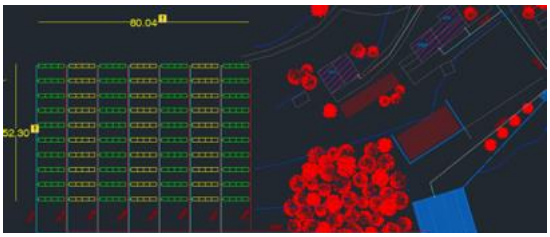

Figure 31: Lamen: The heating plant and the solar thermal system.

6.7 Project partners and cooperations

Region Veneto: The cooperation with the Department for Energy of the Regional Administration was essential for a fruitful workshop in Venice in December 2017.

Municipality of Feltre: Thanks to this cooperation, it was possible to organize one of the capacity building workshops, to kick of the local round table on renewable DH and, finally, to carry out the SDH case study in Lamen.

AIEL (Italian Agro-Energy Association): AIEL was invited as a speaker in the workshop in Venice and was even co-organizer of the event in Feltre. AIEL will also join the local round table in the Feltre area and, finally, through AIEL it was possible to carry out the case study in Polverara.

Biomass Green Energy: The utility managing the DH network in Polverara first of all showed interest in the SDH option for integrating biomass DH and, then, provided Ambiente Italia with the data needed for performing the case study.

AGSM: The utility in Verona provided Ambiente Italia with the information for developing the SDH calculation and is currently in the decision process regarding a possible plant for its network.

Regarding coaching cooperation, it is worth to mention the participation of Thomas Pauschinger, from the SDHp2m project coordinator Solites, in the workshop in Venice. His detailed report on the situation in Germany regarding small renewable district heating in rural areas raised a high interest in the participants, especially because of its high degree of replicability in large areas of the territory of the Veneto region.

7. Activities in Valle D'Aosta (IT)

7.1 Starting situation

District heating in Valle d'Aosta shows a heated volume of 1.6 Mm^3, 30 kilometers of grid (0.8% of the total) and a ratio between heated volume and inhabitants of 12.4 m^3/in.

The use of renewables in the heating sector had, in 2010, the distribution reported in the graph below, where ST covered about 3% and DH had a share of 10%. In the residential sector, the main heating source is oil (33%), followed by natural gas (30.5%), biomass (23.4%), LPG (10.9%) and electricity (2.2%).

The main DH grid, in the city of Aosta, is managed by a private utility while in the smaller grids there is also a public share.

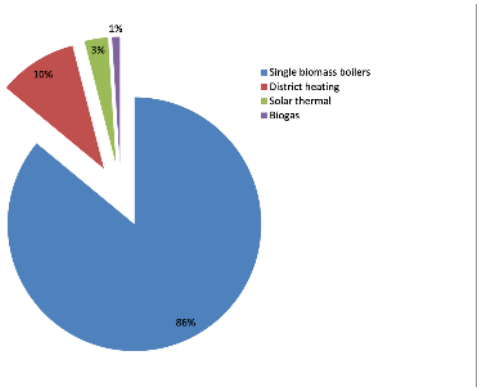

Figure 32: Renewable heat sources in Valle d'Aosta (source: Regional Energy Plan).

According to the national burden sharing of EU targets, Valle d'Aosta has quite an ambitious target of covering, through renewables, 52.1% of the final consumption by 2020. The measures set up for meeting this target do not foresee a key role for solar thermal and for DH.

Given this framework, the main opportunities for SDH can be summarized as follows:

- The continuous growth of thermal consumption.
- The relevant extension of the area without natural gas supply: 50 Municipalities out of 74, corresponding to about 29% of the population.
- Due to air quality issues, in areas where a DH grid is operating, biomass plant cannot receive any incentive, thus becoming an indirect support to the use of solar thermal.

Some specific barriers for solar, especially if used in DH grids, still have to be overcome:

- Potential shadowing from mountain contours, which limit the winter yield of a SDH system.
- Potential visual impact of large-scale ground-mounted SDH plants.
- Gradual increase of the natural gas supply.
- The competition with biomass, an energy source available in large amounts in the region.

7.2 Regional stakeholder advisory groups

Rather than a global group, stakeholder consultation took place in Valle d'Aosta through separate bilateral meetings. Such meetings were mainly organized and led by Ambiente Italia, always supported by Finaosta, the regional development agency, which acts on behalf of the Regional Administration and, in particular, its Department 'COA Energia', dealing with energy matters.

Overall, 6 meetings were held, involving several regional stakeholders, such as DH utilities operating the networks in Aosta and Morgex, the Municipality of Morgex, as well as two consultancy and engineering companies specialized in renewables and district heating.

Thanks to these activities, it was possible to activate stakeholders in different project tasks, such as the feasibility study for a solar integration into the DH network in Aosta, the possible improvement of the existing small SDH plant in Morgex and the advice on installation solutions for solar collectors with low or no visual impact on the territory.

7.3 Overview of policy and market support measures

Policy measure 'Pilot SDH plant in Aosta'

A study about the solar integration into the DH network in Aosta was performed and the quite positive results were very well accepted by the local utility Telcha, which is positive about a possible realization of the plant.

The development of such a pilot SDH plant in the capital city would act as a real policy measure to foster the diffusion of SDH solutions as a viable alternative to district heating networks run on fossil fuels because it would witness the interest of utilities towards solar thermal and also demonstrate the low or even zero visual impact of the collector installation.

Market measure 'Pilot SDH plant in Aosta'

The same measure described above would also act as a powerful market measure showing the positive economics of SDH in similar situation. In fact, despite the low cost of natural gas for running DH networks, several parameters could change for the worse in the short term, such as the Carbon Tax, the price of natural gas and also the reduced taxes for using gas in CHP units, which could be limited or even cancelled.

Of course, all these parameters, in the view of innovative and modern utilities, can shift the balance towards a wider use of renewable, such as solar thermal, in their networks.

7.4 Main events or workshops

WP3 workshop – 'Teleriscaldamento di piccola taglia da solare termico e altre rinnovabili: benefici e opportunità per la Valle d'Aosta ', Aosta, September 28th, 2018.

This workshop focused on the possible integration of solar and biomass for small DH networks in mountain areas, representing all of the regional territory. The main actors cooperating with Ambiente Italia for this workshop were the regional agency Finaosta, the biomass association AIEL and the two regional chambers of engineers and technicians. Around 40 participants attended the workshop, mainly professionals and local authorities.

Figure 33: The workshop in Aosta.

The workshop gave the opportunity, among other topics, to present the results of the feasibility study for a SDH plant in Aosta, witnessing the very positive attitude of the local utility Telcha towards this solution, and the possible technical modifications for improving the performance of the existing SDH plant in Morgex.

WP4 workshop – Technical training with AIEL, Turin, June 21st, 2018.

Thanks to the cooperation with the Italian biomass association AIEL, Ambiente Italia had the opportunity of including a 2-hours training module on SDH, especially highlighting the possible synergy with small biomass-based district heating networks.

Figure 34: Leaflet presenting the training course.

The specific SDH workshop, with around 20 participants, was organized in Turin. Even though the venue was outside of the Valle d'Aosta region, the Piedmont region is bordering Valle d'Aosta and it is much more easily reachable by participants. Furthermore, many professionals operating in Piedmont usually also operates in the smaller region of Valle d'Aosta.

Training webinar – 'Teleriscaldamento solare a Varese: dettagli tecnici e percorso autorizzativo', online webinar, November 20th, 2018.

A specific webinar with one speaker only, Fabio Fidanza, Technical Director at the district heating network in Varese, took place on November 20th, 2018, with a duration of 1.5 hours. Fidanza reported

the details of the plant, addressing both the technical features and its development story, including the motivations, the initiators, the authorization issues and the degree of satisfaction by the utility. The webinar had 34 participants including Finaosta as well as several large and small district heating utilities. In addition to the participants during the live broadcasting of the webinar, the video recording was then uploaded on YouTube where it reached so far 76 more views.

7.5 Project results and impact achieved

Despite the very small scale of the regional territory, the events organized within SDHp2m were able to collect stakeholders and show very practical results: More than **60 local stakeholders** were involved in SDH through the worskhop in Aosta and the training course in Turin.

Figure 35: The training course in Turin.

Furthermore, the training activity on SDH for professional and technicians was included in an already established capacity building programme by the biomass association AIEL, thus allowing to reach a relevant number of interesting stakeholders.

A detailed feasibility study was carried out for the existing DH network in Aosta: The key success story about this study is the very positive attitude of the local utility regarding the results. It is, therefore, quite likely that this SDH plant could be developed in the short term, thus bringing **2,000 m² of solar collectors in the region**.

Finally, it is very important to highlight the process of improvement and optimization of the operation of the existing small SDH plant in the village of Morgex: Such an improvement could bring benefits to the regional SDH market as it can prove the effectiveness of the technology. This is, therefore, a really crucial measure also for increasing the public acceptance of SDH since an underperforming plant at local level can seriously affect the reputation of the whole technological solution.

7.6 Outlook

One of the key topics for the deployment of SDH market in the region is the development of real built examples. In the case of Valle d'Aosta this meant both assess the feasibility of a SDH plant in the largest network in the region, located in the city of Aosta, and improve the performance of the already existing SDH system in Morgex.

The involved stakeholders, the utility Telcha for the Aosta network and both the Municipality and the local utility for Morgex, showed high interest in the results of the evaluation and, therefore, it is likely that both these actions will be completed in the short term.

Finally, the cooperation between Ambiente Italia and AIEL, the Italian Agro-Energy Association, will go on also after the end of the project. Promotional activities through common workshops, brochures as well as lobbying activities towards the Regional Administration (for instance for funding of small

DH networks) will be developed together. Just to give an example, a presentation by Ambiente Italia on SDH was included in a workshop organized by AIEL in the 'Ecohouse' fair on February, 9th 2019.

Figure 36: Solar collectors in Aosta should be placed on both the roof and the ground.

7.7 Project partners and cooperations

Finaosta – COA Energia: The cooperation with the energy department of the regional agency Finaosta was essential for several activities, among which a fruitful workshop in Aosta in September 2018.

Municipality of Morgex: Thanks to this cooperation, together with the local district heating utility 'Le brasier', it was possible to study the optimization of the existing SDH plant in the village.

AIEL (Italian Agro-Energy Association): AIEL was invited as a speaker in the workshop in Aosta and was the main organizer of the training course in Turin where a specific slot on SDH was included.

Telcha: The utility in Aosta provided Ambiente Italia with the information for developing the SDH calculation and is currently in the decision process regarding a possible plant for its network.

Regarding coaching cooperation, it is worth to mention the participation of Jakob Binder, from the SDHp2m project partner AEE Intec, in the workshop in Aosta. His detailed report on the Austrian experience regarding small renewable district heating in rural areas combining solar thermal and biomass raised a high interest in the participants, especially because of its high degree of replicability in large areas of the territory of the Valle d'Aosta region.

8. Activities in Varna (BG)

8.1 Starting situation

Varna region has 495 000 inhabitants, 395 000 of which live in the city of Varna. The only DH in the region, own by Veolia Energy International is operating in the city of Varna. Like all the DH plants in Bulgaria, the DH plant in Varna is from CHP type. The plant uses natural gas as a fuel.

At present, the all of DH companies in Bulgaria use fossil fuels to produce heat: mainly natural gas, but also coal. A total of about 2 million consumers use the heating services of district heating companies in Bulgaria. All DH are a cogeneration type with high regulated price of the produced electricity. All of DH distribute high temperatures 80-100 °C and suffer with high net losses ratio, causing high maintenance costs. The energy prices for households are regulated. With having big fluctuation of the gas prices and rise of the CO2 emissions prices, the regulated DH prices trend to exceed production costs that are straitening the further development of the sector. At the same time end-user's dissatisfaction from some existing DH companies' level of quality services leads to households dropping from DH use.

Figure 37: Region of Varna

Solar energy is not used in centralized district heating networks in Bulgaria. Lack of specific SDH regulation and financial incentives are not encourage energy developers.

Lack of low cost and durable quality solar thermal collectors for large scale projects and at the same time regulated DH price are pushing the SDH projects beyond normal business accepted ROI periods. Lack of knowledge and practical experience for design, construction and operation of large SDH plants is another barrier on the expert's level.

8.2 Regional stakeholder advisory groups

The aim of the advisory group is to stimulate the exploitation of solar thermal energy in the DH in Bulgaria and establish new SDH plants by providing relevant technical information, showing good practices for implementation of SDH, facilitate new projects through stakeholder communication, technology dissemination and financing opportunities, share experience, providing relevant information on financial instruments, improving social image of SDH in the local communities and good practices.

The group includes representatives of municipalities, Ministry of Regional Development, DH, professional chambers and NGO's in the environmental and energy sector. In total there were five meetings plus Webinar where the Big Solar Graz project and the proposal from SOLID and IZEB to Sofia Municipality were presented.

The advisory group meetings gave the opportunity for the establishment of friendly and strong relations between interested DH operators and experienced consultants and their international partners and turn in a stable group of stakeholders looking for political, economical, environmental and business opportunities.

Figure 38: Advisory Group meetings, source IZEB

Figure 39: Advisory Group meetings, source IZEB

8.3 Overview of policy and market support measures

IZEB reviewed the strategic and legal documents related to the realization of RES DH and SDH and prepared proposals for amendments of specific texts to be incorporated into the laws and regulations introducing SDH. The proposals were presented to the ombudsman of Republic of Bulgaria on the official meeting asking for his support and cooperation for the legal facilitation of the SDH implementation in Bulgaria. Moreover IZEB analyzed the Sustainable Energy Development Strategy of Varna and prepared proposals for the development of the new action plan 2018-2020. The document was officially submitted to the municipality of Varna.

8.4 Main events or workshops

A capacity-building training took place on 21th of June 2017 in Varna. More than 40 architects, urban planners, HVAC engineers, investors and DH experts participated in the seminar. Danish and Finnish experts showed SDH technology and its commercial and environmental aspects and benefits. The strategic development and legal barriers for SDH in Bulgaria were also discussed. Moreover IZEB presented two case studies for the implementation of the technology in “Kaisieva gradina” district – Varna and in a small municipality Gorna Malina.

On 4th of July 2018 a workshop concerning organizational and technical aspects of SDH plant realization with around 20 participants (representatives of DH suppliers, professional organizations and the municipality) took place at Sofia municipality. Lecturers of the seminar were leading experts in the field of solar thermal plants from Germany and Austria. Case studies, made by IZEB and international partners were represented as well.

Figure 40: SDH Workshop 21.06.2017 Varna, source IZEB

Figure 41: SDH Workshop 04.07.2018 Sofia, source IZEB

8.5 Project results and impact achieved

There was a great interest in the media on the topic of solar heating, while it was clear that there was a complete lack of information, misunderstanding and frank scepticism, based on controversial subsidies for renewable electricity. In this sense, publications and the media campaign were vital for better public awareness and understanding of the subject. The public campaign from Varna workshop led to large awareness about SDH ecological benefits. As result other invitations and initiatives started. In the summer of 2018 Sofia municipality invited IZEB to propose a plan for implementation of SDH in Sofia. S.O.L.I.D and IZEB have collaborated for a new proposal for SDH pilot plant in Sofia, where the proposal was submitted in December 2018. The rise of CO2 emissions costs in 2018 had a dramatic impact on the business model for gas-based DH and small private DH started to appear (for example Pomorie Hospital with solar heating installation including 700m^2 solar collectors and HP, designed from engineers Velchev and Vassilev, members of IZEB)

Figure 42: Solar heating installation including 700m2 solar collectors for Pomorie Hospital – in operation. Source IZEB

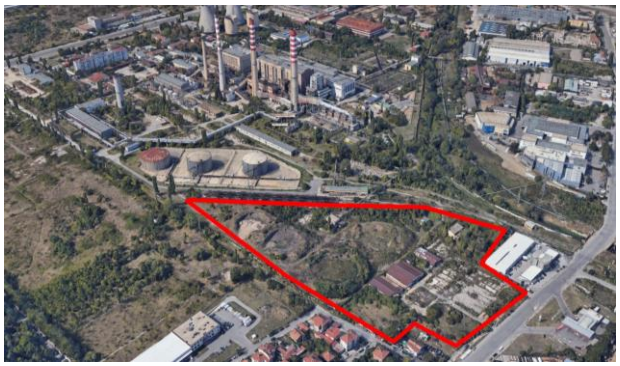

Figure 43: Sofia Big Solar proposal - land for a pilot plant in the premises of Sofia DH

Friendly and strong relations between interested DH operators and experienced local consultants and their international partners opened a door for commercial initiatives in the near future, when regulated prices and fuel prices grow and make SDH application commercially viable.

8.6 Outlook

In the beginning of the project SDH was not recognized as alternative for DH sector. As results of the SDHp2m activities and dramatic change of the fuel prices and CO_2 emissions at the end of 2018, SDH alternative started to be considered as serious technical solution from the energy developers. Being more dynamic and fast moving, the private sector is expected to become the first adopter of the technology in the forthcoming 1-2 years period. Dramatic fluctuations on the energy prices market recently is a strong and sustainable trend, which will make role on successful implementation of SDH, where long term costs are flat and predictive. Recent rise of CO_2 emissions and strong ecological awareness of the society (manly because of air pollution caused of burning coil in the cities) led to rethinking of the future of DH in Bulgaria. SDH is considered as an alternative of sustainable energy development of Bulgaria from the National Climate Change Committee and advocated to be included in the currently developed National Energy Strategy of Bulgaria. Based on the research for Kaisieva Gradina District IZEB submitted proposal for adaptation of Varna Municipality Energy Strategy using SDH.

Четвъртък, 20 септември 2018, 10:31:42

РАДИО ВАРНА

Начало | Новини | Предавания | Акценти | Галерия събития | Рекла

70% от отоплението в ж.к. „Кайсиева градина“ може да се добива само от слънцето

публикувано на 22.06.17 в 13:45

70% от отоплението и подгряването на битова топла вода в ж.к. „Кайсиева градина" във Варна може се покрива от слънчева енергия чрез прилагането на технологията на слънчевите топлофикации. За жителите на Варна това означава огромна възможност за осигуряване на екологично чиста топлинна енергия без вредни емисии и фини прахови частици, както и независимост от вноса на горива. Данните са резултат от проучване, реализирано от Институт за нулевоенергийни сгради в сътрудничество с чуждестранни експерти.

„Слънчевите топлофикации" представляват системи от взаимосвързани термални соларни колектори, които целогодишно произвеждат топлинна енергия за отопление и битова гореща вода. Подобни решения набират популярност в Европа през последните 15 години, особено в Дания. Подобни системи могат да функционират дори още по-ефективно в България, предвид значително по-интензивното слънчево греене у нас" в сравнение с Дания.

Инвестицията в подобна система се възвръща за около 10 години, казват експертите. Поддръжката ѝ е лесна и евтина.

Figure 44: Announce of the IZEB research for application of SDH in Kaisieva Gradina District in Varna with 70% solar share, source IZEB

Figure 45: Varna media conference 20.06.2017, source IZEB

Small municipalities are looking for energy reduction of the municipal buildings: administrative, schools, kindergartens, sports halls. Using ESCO contracts with partially granted programs for green innovative technologies they see opportunities for implementing SDH in small scale (1-2 GWh/a). For example, as result of SDHp2m initiatives the mayor of Gorna Malina Municipality attended on several project events and meetings and initiated a 1 GWh/a SDH project, applied for funding in 2016 and again restarted in 2019. The project is consulted from SDHp2m partners IZEB and PlanEnergi.

8.7 Project partners and cooperations

The IZEB worked close together with the Municipality of Varna, Municipality of Gorna Malina, Municipality of Sofia (Green Capital Agency). Very fruitful was the cooperation with Varna DH Veolia Energy. Intense project cooperation was with the Danish, Austrian and German project partners, which supported in workshops, coaching and key studies: PlanEnergi, AGFW, SOLID and AEE INTEC.

9. Activities in Poland

9.1 Starting situation

The main fuel used by the licensed companies is coal (2013 - 77%). Heat from renewable energy and natural gas in the production structure includes a relatively small part (2013 - RES 6.9%, natural gas - 7.9 %). The demand for heat supplied through the central network has been steadily decreasing, but in Poland it still continues to be the most important form of heat to meet the needs of households and industry. The structure of households energy consumption per capita regarding different energy sources in the EU and in Poland in 2012 is shown in the figure below.

Figure 46: Fuel for heat in Poland Source: Energy 2015, The Main Statistical Office, Warsaw 2015

The energy efficiency directives requires reaching, mainly using RES or waste heat (in both cases energy storages are needed), the position of effective district heating system. Currently, according to Polish District Heating Chamber of Commerce (IGCP), only 15% of the district heating enterprises meets the criteria of effective district heating system. What is more, the “MCP” directive (directive on the limitation of emissions of certain pollutants into the air from medium combustion plants) requires fulfilling – mainly using RES and thermal energy storages (in place of highly emitting coal-fired boilers) – higher and higher emission standards concerning sulphur oxide (SO2), nitrogen oxides (NOx) and particles(dust). Gradual replacement of the oldest boilers fired with solid fuels, could allow the DHCs to avoid high costs of investment on modernization and adjustment to new environmental standards.

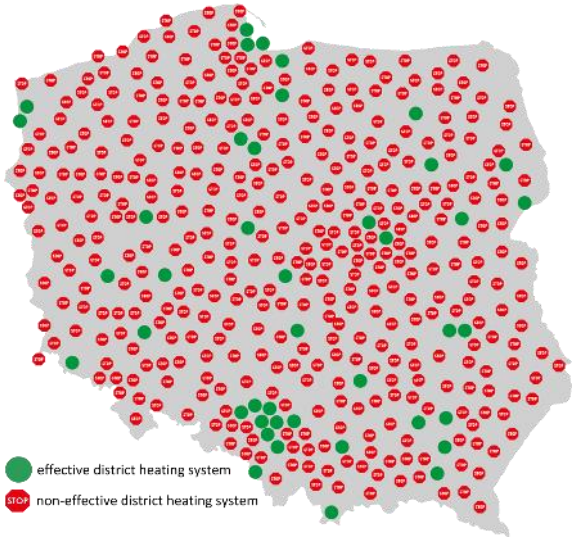

Figure 47: District heating companies in Poland: effective and non – effective, source: IGCP

9.2 Regional stakeholder advisory groups

The stakeholder advisory group was set up in cooperation IEO and the National Fund for Environmental Protection and Water Management (NFOŚiGW) in Poland. There were participants like: Chambers of Commerce Polish District Heating, municipalities, decision-makers: representatives of the Energy Regulatory Office, NFOŚiGW, district heating companies. The number of meetings of advisory group was 7 (one meeting in 2016, one meeting in 2017 and five meetings in 2018) and one delegation travel to Denmark in 2017. The main point of interest of polish DHCs is possible of financing RES investment. Two of first meetings were informative about possible invest in RES technology by DHCs, but the next were typical technical and financial: DHCs presented their plans for modernization with renewable energy sources.

9.3 Overview of policy and market support measures

Policy measure: Innovative investment plan: transition from coal fired boilers to renewable energies in district heating company – case study of Końskie: The first step was to analyze the overall situation in district heating company in Końskie including availability of local renewable energy resources and waste heat and the next - development of the new and replicable business model of the district heating operator. Analysis has shown that there is necessary invest several scalable generating technologies with seasonal heat storage. One of the main reasons of adoption of the plan were: 1. compliance the directive 2012/27/EU and improvement of efficiency of the system, by wider use RES in district heating, 2 fulfill the new and foreseen emission standards and reduce substantially emission of CO2, 3. improvement of attractiveness of RES based district heating systems and development of innovative services addressed to new clients and target groups. The innovative investment plan of DHC Końskie includes i.e. : Extending the share of renewables and waste heat from industry in the heat volume supplied to current and perspective end users, especially from housing sector (cohabitants), centralised renewable heat generation: solar thermal system, green (wind) power to heat and biomass, decentralised introduction of solar thermal collectors (supported by gas) as a source of hot water in summer and integration of local generation with district heating in winter peaks, utilisation of waste heat from one or more ceramic factories located in the city, introduction of short (decentralised) and long term (centralised) storage systems into the district heating company operation, demonstration of a complete system long term storage, based on offering services to different types of final users, like excess industrial heat management, balancing of weather dependent RES (solar thermal and power-to-heat solutions) integrated with storage services, development of the new and replicable business model of the district heating operator as energy integrator on the community scale.

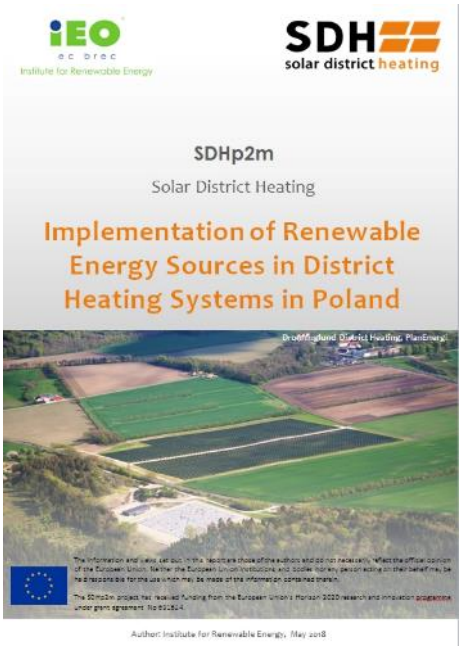

Figure 48: Brochure - Implementation of Renewable Energy Sources in District Heating Systems in Poland

Market support measure: Brochure: Implementation of Renewable Energy Sources in District Heating Systems in Poland: The brochure presented realization of goals and European commitments in district heating sector in Poland potential of use of new technologies in RES in district heating systems, competitiveness of prices of heat from RES with heat from conventional sources and district heat development scenario development by IEO. The brochure is online version and it was send to DHCs by Polish Chamber of Commerce District Heating, NFOŚiGW and IEO to: DHCs, municipalities, governments and others.

9.4 Main events or workshops

Several meetings, workshops and conferences were held by IEO in Poland.

On 17th January 2018 took place the conference with nearly 130 attendees organised jointly by the NFOŚiGW and IEO. Many of presidents of the boards and directors of DHCs took apart in the conference. President of the Board NFOŚiGW – Kazimierz Kujda announced preparing a programme to finance a series of pilot projects on renewable district heating for the Polish district heating industry on the conference.

Figure 49: Conference in Poland

31st August 2018 took place the workshop for DHCs interesting in new subsidy program. The workshop was organized by NFOŚiGW and IEO. There were nearly 110 participants, mainly directors and managers of DHCs. During the conference, the attendees expressed interesting in participating the new program for build RES installation with storages in DHCs.

9.5 Project results and impact achieved

Heat from renewable energy sources – new subsidy program for DH companies: IEO is working with the board the National Fund for Environmental Protection and Water Management (NFOŚiGW) on create the incentive program for SDH development in Poland. The new program of support for district heating companies will be for the construction of large-sized solar thermal installations and other RES with seasonal storage. IEO observes significant interesting many DHCs new subsidy program dedicated RES from heat but no significant investment has started yet and therefore there is not seen any significant change in the fuel mix at Polish DH. NFOŚiGW in cooperation with IEO organised several meetings with DHCs for recognition potential participation DHCs in new subsidy program. Fourteen DH companies applied for participation in meetings and thus in the support program of National Fund. The expected date of launching the program by the National Fund is the end of the 2018 year /beginning 2019 year. The monitoring of the development of the fourteen initial project concepts and proposal for funding is ongoing. The new program will be the first program thanks to it could build solar collectors with seasonal storages in Poland.

9.6 Outlook

Earlier the topic of solar district heating was not popular in Poland. District heating companies were not interesting in such technologies like solar collectors or seasonal storages. The one RES technology which was DHCs were interesting was only biomass boilers. Now, we can see quite another situation, the polish DHCs are open for new technologies and invest in solar collectors or power to heat or seasonal storages. But, there is thanks to cooperation with NFOŚiGW to establish new subsidy program. Fourteen DH companies applied for participation in special meetings and thus in the support program of National Fund.

Beside, one of the polish DHCs, DHC Końskie applied for grant to H2020 - Combining Renewable Technologies for a Renewable District Heating and/or Cooling System thanks to close cooperation with IEO and project partners.

9.7 Project partners and cooperations

Most of all IEO strongly worked with financial institution - the National Fund for Environmental Protection and Water Management (NFOŚiGW), but also Chambers of Commerce Polish District Heating, polish district heating companies and companies from RES sector.

Also, close project cooperation was with Denmark, German, Austrian and Sweden partners.

10. Activities in Västra Götaland (SE)

10.1 Starting situation

Solar District Heating (SDH) was pioneered in Sweden with >10 plants in the 1970's and 1980's. It was not until 1996 when any other country (DK) built a larger plant than already built in Sweden. The aim was to replace oil in district heating (DH). In parallel, there was a very positive development to replace oil in DH with solid biofuels and now there are block and district heating (B&DH) systems, primarily based on solid biofuels and waste heat, in all Swedish cities and in the majority of other urban areas.

Figure 50: Region of Västra Götaland

Region Västra Götaland has 49 municipalities with 1.6 million inhabitants. The total land area (24 000 km^2) is equal to half of Denmark and the population density (66 inhabitants/km^2) is close to the EU average.

Region Västra Götaland has more than 100 bioenergy based B&DH systems. The use of fossil fuels is very low, and thereby the need to replace fossil fuels, but there are only a few B&DH systems combined with solar heating.

There is no specific governmental support, neither for B&DH, nor for solar heating plants. However, the majority of DH companies have goals to provide 100% renewable energy (mainly bioenergy). The major barrier for SDH is the low cost for bioenergy (wood chips) and the lack of operational experience among the district heating operators.

10.2 Regional stakeholder advisory groups

Considering the starting situation above and taking part in SDH since 2010, it was rather obvious that the objective of an advisory group was to create the necessary conditions to build new Swedish SDH demonstration plants based on the most recent SDH plants in Ellös (2010) and Vallda Heberg (2013).

A small advisory group was formed involving the regional energy office and a couple of experienced consultants. The advisory group initiated a survey of potential DH plants, disseminated the possibility to participate in, and initiated a number of, feasibility studies. It also organized two seminars, one to present the objectives (September 2016) and one where the feasibility studies were presented (September 2018).

The advisory group has also initiated a number of articles in journals and two presentations at the SDH conferences.

Figure 51: Recent SDH plants in Sweden: Ellös (2010) and Vallda Heberg (2013).

10.3 Overview of policy and market support measures

The main policy and market support measures were a **survey of existing B&DH plants** and **feasibility studies for potential SDH demonstration plants**. The survey (see fact sheet D4.1) was carried out as a master thesis and the feasibility studies (see fact sheet D3. 1) were carried out by CIT Energy Management AB with support from interested plant owners and an experienced SDH consultant.

10.4 Main events or workshops

The main regional events are two SDH seminars. The first was held in Alingsås (Title: “Bio-/solvärmeseminarium / SDHp2m”; September 16, 2016) and the second was held in Kungsbacka (Title: “Solvärmedag”; September 18, 2018).

Participants at SDH-seminar in Kungsbacka, September 2018, 2018.

The first seminar included presentations of the SDHp2m project, the result of **the survey of existing B&DH plants in Region Västra Götaland**, an overview of SDH in Europe and presentations by experienced SDH consultants. The seminar was attended by about 20 interested representatives for plant owners and municipalities (out of >50 representatives for plant owners and municipalities invited to the seminar).

Figure 52: SDH Seminar in Sweden

Figure 53: Pictures from study visit at Tölö Ängar, Kungsbacka, September 18, 2018.

Figure 54: Pictures from study visit at Tölö Ängar, Kungsbacka, September 18, 2018.

The second seminar was combined with study visits to Vallda Heberg (Block heating plant combining pellet boilers and roof integrated solar collectors from 2013) and Tölö Ängar (New buildings with roof integrated solar collectors supported by bio-based DH from 2018) in order to attract more participants.

The seminar included presentations about SDHp2m, the performed **feasibility studies for SDH**, an IEA study about the potential for SDH in Europe and presentations of three SDH plants). The second seminar was attended by about 70 interested representatives for plant owners, municipalities and housing companies together with regional energy advisors.

10.5 Project results and impact achieved

It is difficult to quantify how the situation in Sweden has changed during the SDHp2m project duration, but it is possible to describe a couple of “success stories”.

First, the municipal housing company **EKSTA Bostads AB**, that built their first solar heating system in the 1980's, still continues to consider solar heating in all new building developments. The residential building area Vallda Heberg, with a block heating plant combining roof integrated solar collectors and a pellet boiler, has had numerous study visits (including SDHp2m and IEA SHC participants), since it was built in 2013. The latest example is a new residential area Tölö Ängar built in 2018 with roof integrated collectors connected to biobased DH (see previous chapter).

Figure 55: Feed-in solar heating system on the sports arena in Ystad.

Second, the municipal district heating company **Ystad Energi** installed and marketed a solar feed-in system at a sports arena in 2017. This plant is the latest in a row of feed-in plants built in Sweden since 2000. The plant is using solar collectors from Savo Solar (new actor in SDH), is equipped with an advanced control system and was awarded the (national) Solar energy plant Award in 2018, as it is a good example how solar heat can be implemented in large Swedish DH systems. The Solar Award gave a lot of publicity.

Third, the regional energy utility **Gotlands Energi AB** (GEAB) is, based on the feasibility study within SDp2m, planning to refurbish their district heating plant in Hemse with ground mounted solar collectors and a new wood chips boiler. GEAB had two representatives at the 5th SDH conference in Graz. Gotland is Sweden's largest island with a plan to be self-sufficient based on renewable energy (bio energy, wind power, solar heat and power) within a decade.

Figure 56: Arial view of the heating plant in Hemse with a lot of space for a collector array.

GEAB is further part-owned by Vattenfall, the largest energy utility in Sweden (which also is involved in SDH projects in DE). The realization of the plant in Hemse will likely have an important and positive influence of the development of SDH in Sweden.

10.6 Outlook

The early Swedish development of large module collectors supported the establishment of market leaders as ARCON (DK), as well as SOLID (AT), while the domestic collector industry has disappeared. There has been a very positive development of bio energy in DH and the governmental incentives for solar heat has been cancelled.

Despite that, six new large scale solar heating plants (>500 m^2 solar collectors) have been built based on different incentives (including branding), during the duration of the SDH projects starting in 2010. Furthermore, the feasibility studies carried out within SDHp2m confirm that it is important to build at least one new plant, to demonstrate present economics and simple and reliable operation, as that is a requirement in order to convince the DH actors.

Thus, as already mentioned, the realization of the plant in Hemse will likely have an important and positive influence of the further development of SDH in Sweden. Another important aspect for the future outlook is the development of the demand (and thereby the price) for bio energy in other areas than DH, like transports and to replace petroleum products.

10.7 Project partners and cooperations

The Activities in Region Västra Götaland were managed by the SDHp2m partner CIT Energy Management AB

CIT Energy Management AB
A Chalmers Industriteknik Company

The core regional partners in the SDHp2m project were:

Region Västra Götaland – Gustaf Zettergren responsible contact and co-author of papers presented at the SDH conferences (see references).

Hållbar Utveckling Väst – Regional energy office, Region Västra Götaland – Regional survey of B&DH plants and seminar in Alingsås, September 16, 2016.

Svensk fjärrvärme (Swedish district heating association) – Initial partner that left the project in 2016 having merged into Swedenenergy (Energiföretagen Sverige)

Svensk solenergi (Solar Energy Association of Sweden) – Host for www.solar-district-heating.se and host for the seminar in Kungsbacka, September 18, 2018.

Andersson & Hultmark Ing.byrå AB – Consultant to EKSTA Bostads AB (Vallda Heberg and Tölö Ängar) and support to the feasibility studies.

Energianalys AB – Consultant to Ystad Energi AB (Ystad Arena).

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10.8 References

The main policy and market support measures, i.e. a **survey of existing B&DH plants** and **feasibility studies for potential demonstration plants**, have as mentioned been presented in fact sheets. They are also presented in two papers at the SDH conferences.

Dalenbäck, J-O, L. Thrysøe Ekström, and G. Zettergren (2016) **Feasibility for SDH in Region Västra Götaland**. 4th International conference of Solar District Heating. Billund, DK. www.solar-district-heating.eu

Dalenbäck, J-O and G. Zettergren (2018) **Feasibility Studies for SDH in Region Västra Götaland**. 5th International conference of Solar District Heating. Graz, AT. www.solar-district-heating.eu