



Intelligent Energy Europe Programme
of the European Union

SDH 
solar district heating



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of the European Union

**SDHplus –
New Business Opportunities for Solar
District Heating and Cooling**

WP5 – One-to-one coaching of DH stakeholders in learning
countries

Task 5.1 – Macro analysis report of the market conditions
for SDH and policy recommendations – Summary report

by
AF-CITYPLAN s.r.o.

Deliverable:

WP 5: One-to-one coaching of DH stakeholders in learning countries

Task 5.1: Macro Analysis of the Market Conditions for SDH

Deliverable 5.1: Macro analysis of the market conditions for SDH and policy recommendations

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Background for this summary report

The aim of WP5 on “One-to-one coaching of DH stakeholders in learning countries” is to provide a one-to-one coaching of organisations from countries which are newly integrated in the SDH consortium (ES, FR, HR, LT, PL, SL), in order to initiate the ‘SDH process’ at national level as developed in the SDHtake-off project.

Organisations from countries are newly integrated in the SDH consortium (ES, FR, HR, LT, PL, SI) benefit from one-to-one coaching for initiating ‘SDH process’ at national level as developed in the SDHtake-off project. Supported by the experienced partners these learning countries shall replicate useful activities carried out in the SDHtake-off project (macro analysis of boundary conditions, involving of DH stakeholders, training courses, supply side support, help desk). These new partners are in addition fully integrated in the international events as described in WP 6. IT and CZ as learning countries of the SDHtake-off project are also integrated in the one-to-one coaching, they, however, do not participate in tasks 5.1 to 5.3.

In general the consortium shall pro-actively network, i.e. all expert partners shall be available for the coaching of all ‘learning countries’ partner, however, the following one-to-one coaching scheme is proposed for defining one main reference partner for intensifying the cooperation and transfer.

- ES (and IT) are coached by SFZ
- FR and LT are coached by PLANENERGI, DDHA
- HR and SI are coached by SOLID
- PL (and CZ) are coached by ENERMA

Compared to the SDHtake-off project, the activities of Tasks 5.1, 5.2 and 5.3 which were performed by the ‘experienced partners’ in SDHtake-off and which are now performed by the ‘learning partners in SDHplus, include now new elements which bring an added value compared to the SDHtake-off project.

- The new macro analysis will take into account NREAPs and new national laws of implementation of the EC directive, regarding both DH provisions and incentives for ST
- The new training will be based mainly on practical calculation exercises derived from the case studies, focusing on specific national regulations, economic conditions, etc.

- For improving the help/desk description the guidelines developed in the SDHtake-off are used and a horizontal evaluation of the level of knowledge of SDH by utilities and other stakeholders is done

The objective is to identify the specific national boundary conditions and market obstacles for SDH (energy policy, regulations and laws, urban planning policy technical and economical, subsidy and certificate schemes regulatory, stakeholders) in the learning countries. In-depth information on market needs for the macro analysis is gained from the national working meetings with target groups. Macro analysis are performed for ES, FR, HR, LT, PL, SI. They are presented in macro analysis report. On this base the partners elaborate recommendations for market, support schemes and policy improvements and forward them to policy makes at national level.

In addition critical views to whether the market boundary conditions are adequate for taking account of renewable district heating and the manner in which they could be improved shall be reported and communicated to the authorities responsible for legislation and regulations. This will be done through direct contacting and/or sector association contacts. This shall include also new findings and changes in the legal regulatory framework coming-up during the project lifetime.

This report is based on the document “Boundary Conditions and Market Obstacles” made during the SDHtake-off project by CIT Energy Management AB (Jan-Ol of Dalenbäck, Sven Werner) .

1. INTRODUCTION

There are thousands of district heating systems in Europe. There are only about 65 solar district heating (and cooling) systems with a nominal thermal power >1,000 MW, out of which 31 in Denmark, Sweden (9), Germany (8) and Austria (3).

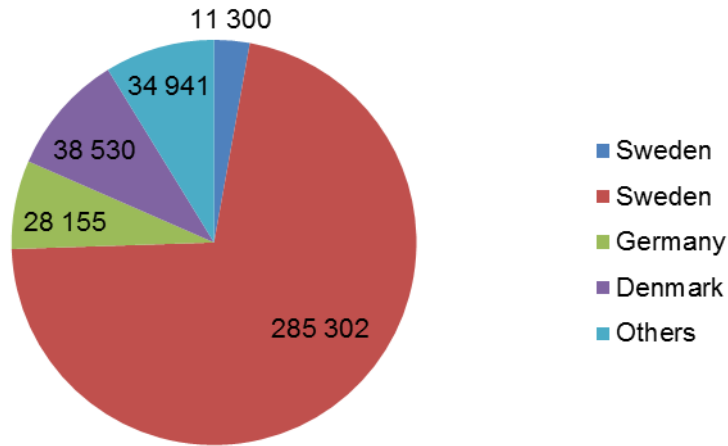


Fig. 1 Installed capacity [m²] in systems > 1000 m²

All together there are >135 large solar heating (and cooling) systems with a nominal thermal power of >0,350 MW in operation in Europe, out of which a couple of small plants in the Czech Republic and Italy.

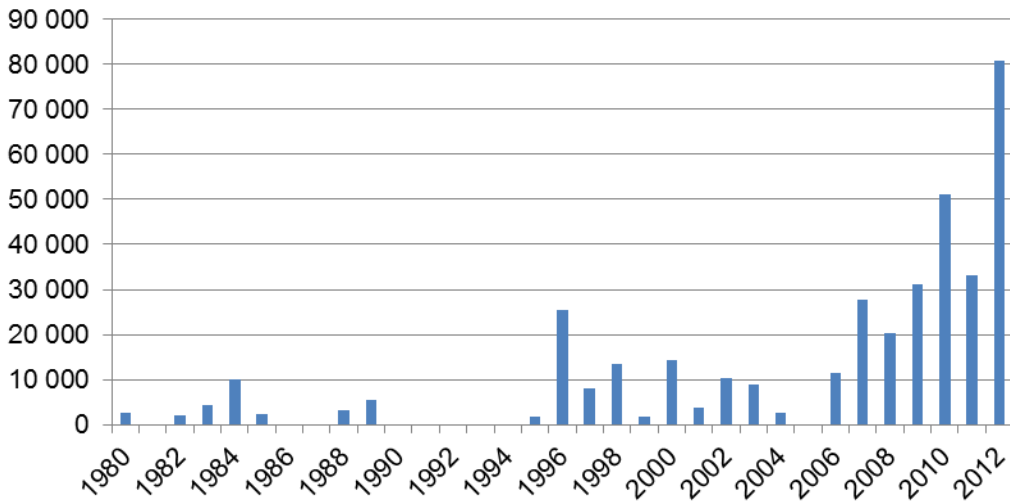


Fig. 2 Installed capacity [m²/year] in systems > 1000 m²

Essential increase of installed capacity in solar district heating systems underway in Denmark due to several reasons e.g. example higher taxation of natural gas. Anyway the progress in Denmark shows that SDH is a sufficiently developed solution for increasing a share of RES in DH systems from the technical point of view.

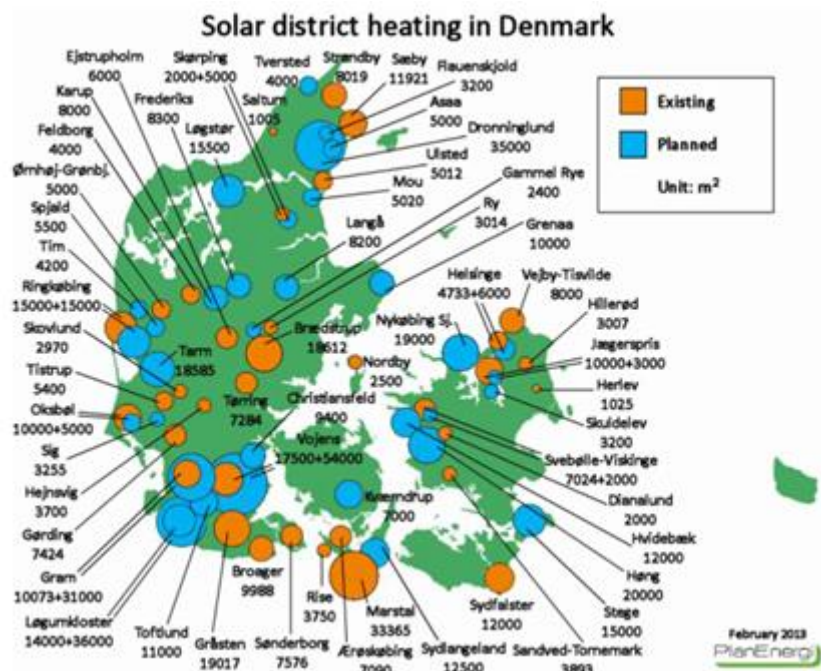


Fig. 2 Solar district heating systems in Denmark (Source: PlanEnergi)

The objective of this report is to summarize the specific national boundary conditions and market obstacles (energy policy, regulations and laws, urban planning policy technical and economical, subsidy and certificate schemes regulatory, stakeholders) for the start of SDH implementation in new-coming countries participating the SDHplus project that are Croatia, France, Lithuania, Poland, Slovenia and Spain. This report provides reader with summary information sheets a concentrated data in attached national questionnaires, while wider information about state of the art in particular countries are included in separate national reports.

2. EUROPE

National planning and construction issues

There are varying national, regional and local requirements for renewable heat (energy) in new buildings and there are varying national, regional and local requirements for solar heat in new buildings. Most of these requirements is based on the implementation of the European Energy Efficiency Directive. There are few barriers for large scale solar thermal systems like price of the land or restricted application on historic or protected areas. There are few actors involved in the development and poor capacity for planning, design and construction of solar district heating systems in most of the assessed countries.

National solar support issues

There are varying financial incentives for renewable heat and varying financial incentives for solar heat in general, but only Spanish support scheme is applicable for solar district heating.

National interfaces between solar heat and district heating systems

It is possible to sell heat into the district heating systems in Croatia, France and Lithuania and possible to apply net metering (for DH customers) in France and Lithuania. Heat transfer using DH networks (third party supplier to a specific customer) is not possible in newcomer countries except Poland (theoretical possibility – there is not such a case in praxis).

The main alternatives to solar in the newcomer countries are natural gas and biomass boilers. SDH has to compete with coal and natural gas CHP in two of investigated countries. The alternative operation costs vary from 37 up to 110 (heating oil boilers) EUR/MWh.

Almost all district heating systems in newcomer countries are operated on temperatures over 70 °C.

Summary

European directives implemented into the national legislations set general obligation for RES feasibility investigation during the design process of new buildings. This requirement includes solar thermal systems as local heat source but also as a part of (partly) renewable district heating. Evaluation of alternative energy sources is emphasized by requirements on renewable energy share in energy demand of building in several Eu-

ropean countries. Mentioned requirements include RES into investor's decision process, but from the other point of view it is still a struggle between several types of heat sources, with different market conditions. National support measures in several countries are not balanced and make solar thermal not competitive with e.g. biomass.

Space requirements for placing solar collectors are one of the limiting factors regards to the price of land. The other issue is placing collectors in urban (and especially protected) areas. Because the authorization process for large scale solar thermal system can involve many participants, the cooperation with municipality and urban planners is crucial for solving all special demands. Also the communication on the intention to public might be decisive for the final result of the project.

3. CROATIA

District heating covers about 10% of the heat demand in Croatia. There are no solar district heating systems in operation.

There is a general support for renewables (with regard to producing electricity) and occasional support on regional/municipal level for solar heat but not in relation to district heating. The major driving forces are the interest to demonstrate solar district heating and to reduce the use of fossil fuels in district heating.

National planning and construction issues

There are national recommendations for use of renewable heat in new buildings. There are limited restrictions on available areas for solar collectors.

There are no actors involved in the development but there is a lack of capacity available for planning, design and construction of solar district heating plants.

National solar support issues

There are no national financial incentives for renewable heat, only occasional support schemes for solar heat on regional/municipal level excluding SDH.

National interfaces between solar heat and district heating systems

It is possible to sell heat into district heating systems, but it is not currently possible to apply net metering for DH customers or to transfer heat in the district heating systems in Croatia.

The main alternative to solar heat is recycled heat from CHP and heat from natural gas and fuel oil boilers. The alternative operation costs vary from low 40 – 50 EUR/MWh (CHP) and high 65 – 85 EUR/MWh (boilers).

The operating and especially the return temperatures in (old) district heating systems are high for solar heat (>60°C and sometimes >70°C).

4. FRANCE

District heating currently distribute 5-6% of heat consumption in the residential and tertiary sectors in France. 450 networks with a power greater than 3 MW have been identified and many more with smaller power. Most of these district heating networks operate at high temperature but the trend is to decrease the temperature or to build new low temperature networks for Eco district.

Two years ago solar district heating was unknown in France. The first actions have been dedicated to communication about what is Solar District Heating with different sectors (local authorities, district heating operators, solar industry, engineering offices, local energy agencies...). In parallel some industrial actors showed their interest for solar district heating and they decided to build the first SDH plant in France near Toulouse (delivery planned for the second semester of 2013). It should be followed by another one in Juvignac.

Due to the real interest of district heating operators or municipalities some case studies are in progress. Until now there was no specific financial support for solar district heating. In order to develop some pilot plant the French Environment and Energy Management Agency (ADEME) has launched a call for New Technology that includes Solar District Heating (only a one time call). The proposals need to be submitted before 14th May 2013. Two case studies that have been conducted within the SDHplus project might be proposed to this call.

After this first phase of introduction to solar district heating, we will continue our actions in order to extend our communication with other actors, and lead to first pilot plant to show the validity of the approach in southern European countries.

The SDHplus project is complementary to a national project on Solar District Heating called Smart Grid Solaire Thermique financed by ADEME. The Smart Grid Solaire Thermique project is focus on technological development for Solar District Heating and has been launched in July 2012.

National planning and construction issues

The national RES objective for 2020 means doubling RES production by 2020. Solar thermal is poorly represented in the RES development roadmap, which did not take SDH into account when it was drawn. On the other hand, DH development is seen as a necessary mean to reach this objective.

Hence, the "heat fund", dedicated to heat RES development, helps RES production on DH and DH development (pipes).

The new building code (dating 2012), encourages building developers to connect their new building to DH, by allowing higher consumption requirements when the building is heated by a low carbon emission DH (ie DH using mainly RES).

Another opportunity for SDH relies on Ecodistrict developments. When there is a political will to have an exemplary Ecodistrict project on energy issues, solar is generally chosen. But the current tendency is to have only HDW solar production or photovoltaic on buildings. Providing information to local authorities and urban planners could allow SDH to be taken into account in Ecodistrict projects. A significant share of French territory is considered as a land usable for agricultural purposes. This classification leads to a very difficult possibility for solar collector field implementation. Price of land can be a barrier for SDH development. There is a lack of experience with installation and maintenance of large scale solar thermal plants.

National solar support measures

The support measures are aimed only at HDW production: income tax reduction for individual installations and Heat Fund for collective installations.

There are support measures for RES DH development but none specific to SDH.

National interfaces between solar heat and district heating systems

There are no direct interfaces yet. In the only existing SDH project, DH operator is responsible for solar and other heat productions. There are a couple of existing DH where solar is installed on some connected building, but solar heat is used only to save energy from DH, without any injection into the grid. The main barrier relies in the high operating temperature of most existing DH.

Dissemination of Macro analysis

The solar district heating market is still emerging in France, but national ambitions in terms of development of renewable heat and solar thermal systems hold the promise of interesting prospects in the medium term. However the regulatory framework and support mechanisms were not designed to support the sector of solar district heating systems and therefore have to be adapted. The operational stakeholders in the sector also have a role to play in designing business models and legal tools to make solar heat on DH even more competitive.

The macro analysis of the market conditions for solar district heating has been disseminated to a national group of actors developing SDH in France through the research project Smart Grid Solaire Thermique (COFELY – DH utility, CLIPSOL – Solar collector manufacturer, INDDIGO – Engineering office, TECSOL and CEA INES). This analysis was also presented to ADEME in the framework of their development of subsidies for

developing large scale solar system installation. AMORCE published a document on Solar and District heating that highlighted legal framework issues (mainly in the building rules). AMORCE also succeeded with the National Energy Transition Law to make sure RES DH are correctly taken into account in the local authorities, urban planning and building rules, to make the DH master plan mandatory and to set an ambitious goal for RES DH development by 2030.

Moreover, a synthesis of the SDH related context, actions and results were presented at the 3rd International SDH Conference in Toulouse, in June 2015. The macro analysis has been used to set up and explain the national context. Specific presentations also targeted the French participant composed of DH operator (public and private), local authorities, manufacturers and engineering offices. Finally, the macro analysis will be transfer to a regional stakeholder, namely RAEE (Association for Renewable Energy in Rhône-Alpes), who demonstrates a deep interest in the SDH topic and who is in relation the Rhône-Alpes Regional Council.

Since the beginning of the SDHplus project the context has changed: the two first solar district heating systems are in operation and national subsidies for SDH are available through two specific yearly call for project launched by ADEME.

5. LITHUANIA

Development of district heating is limited due to market saturation. District heating companies cover between 60% and 90 % of heating market in the largest cities in Lithuania.

Solar collectors are installed on the roofs of the boiler-houses in district heating companies JSC "Kauno energija" and JSC "Ignalinos šilumos tinklai". The solar collector preheats return heating agent and is adapted to specific framework conditions as reduction of heat losses in district heating networks is the main reason for such installation.

New wood biomass boilers or CHP plants are installed in reconstructed boiler-houses for heating purposes during the whole year. These reconstructions were implemented using EU support. New installations for heat generation, such as solar collectors, require additional investment and district heating companies have no money for such investment. Majority of not renovated block residential buildings consume a big amount of thermal energy for heating purposes during heating season.

District heating network operators have obligations to buy renewable heat in case it is cheaper than heat produced from fossil fuel.

National planning and construction issues

There are national requirements for the use of energy from renewable sources in new buildings. Buildings meet energy requirements of A++ energy efficiency class if ratio between renewable and non-renewable energy consumption in the building is < 1 . All new buildings have to meet energy requirements of A++ energy efficiency class after 1st of January, 2016.

District heating sector expects to achieve the use of up to 50 % share of RES until 2020.

National solar support measures

There are national financial incentives (favourable feed-in tariffs) for renewable electricity, including PVs, but no specific incentives for solar heat.

National interfaces between solar heat and district heating systems

It is possible to sell heat into district heating networks for networks operator and to measure sold heat volume, however, it is not possible to transfer heat (as third party supplier to the specific consumer) in the district heating systems of Lithuania.

Due to the fact that high temperatures are maintained for heating agents in DH systems, it is relatively complicated to introduce solar heat into system operation. Heat

supply temperature is about 70oC during summer season and about 100oC during heating period in winter. The return temperature of heating agent is about 40oC during summer season and about 70oC during heating period in winter.

Heat from wood biomass boiler-houses and wood based CHPs is the main alternative to solar heat. Biomass heat production costs are relatively low - ~ 4.6 ct€/kWhth.

District heating companies are interested in reduction of heat losses in networks only. Reduced temperature of heat carrier means lower heat losses in networks. This is seen as opportunity for district heating companies for introduction of solar heat.

6. POLAND

The district heating market is characterized by local scale of activity on nearby markets. The companies and network operators are active in specific cities or agglomerations and the competition between district heating companies on such areas is practically possible only at the stage of making a decision, which pertains building new or expansion of existing heating networks. The existing installations, particularly network infrastructure are of weak technical conditions and need investment

The number of licensed DH companies is systematically decreasing since 2002 from 894 (in 2002) up to 480 in 2011. The heat production in 2011 reached 421.3 PJ (including heat recovery in industrial processes). More than 64% of the heat produced (252.2 PJ) belongs to CHP units.

In 2012, approximately 302,000 m² of solar collectors were sold in Poland. The average growth rate at the level of 30 – 40% continues to be one of the highest among all the renewable energy sectors in Poland and also in comparison to the solar collector markets in other EU countries. There are around 70 producers and/or distributors of solar collectors - the first 'top ten' consists more than 90% of the market.

The total solar thermal surface has exceeded 1 mln m² in 2012, namely 1,211 mln m², which is an equivalent to 848 MW_{th} of installed heat power capacity.

The growing trend was enabled due to the waiting period for grants that the beneficiaries received from Regional Operational Programs (ROP) and from the National Fund for Environmental Protection and Water Management (NFOŚiGW).

National planning and construction issues

Renewable energy heat may decrease the total annual energy demand for new building (renewable heat decreases the total use of energy). There is an obligation for analysis of renewable heat supply option in new buildings. There is a lack of practice and knowledge of solar district heating systems designers.

National solar support issues

There are no national financial incentives for renewable heat. As a part of its statutory goals the National Fund for Environmental Protection and Water Management has launched in 2010 the grant programme for solar collectors. The grant, reaching up to 45% of credit for the purchase and installation of solar collectors, attracted over 25,000 applicants between 2010 and 2012. Considered a success the program has increased its budget and extended the application submitting time. Despite the considerable 8.1% tax value on the grant, an opportunity to co-finance the project in approximately 31% (the second tax threshold is 37%) is an attractive proposal, which may contribute considera-

bly to the utilization of solar energy in households. In 2010 the massive inflow of applications to the Regional Operational Programmes (ROP) commenced. A powerful incentive for investors was the possibility of obtaining, in certain cases, an 85% grant from the European Regional Development Fund. According to the NRAP the aim for the 2020 is on the level of 14 mln m², which is an equivalent to 10 GW_{th} of installed heat capacity.

National interfaces between solar heat and district heating systems

It is not possible to sell heat to DH grids in general no kind of third part access is applicable in Poland.

The designers and operators of large scale installations indicate that there are problems related to synchronization and control of the work of interconnected different heat sources. The advancement of knowledge takes place on the basis of operational experience, which is particularly important for the monitoring capabilities of the service

7. SLOVENIA

Existing driving forces and opportunities that favour expansion of DH

At the end of 2009, the Energy Agency prepared an Announcement about the Status of the Production Facilities Using Renewable Energy Sources or High-Efficiency Cogeneration in the Electricity Market for 2010. The announcement determined the methods for calculating the reference prices for electricity and energy sources which has an influence on the amount of operational support provided for the electricity produced from renewable sources or in a high-efficiency cogeneration of electricity and heat as well as the reference costs of energy sources influencing the amount of the flexible fraction of the reference costs for individual groups of the above production facilities. In order to obtain support, an owner or a leaseholder that is producing or is going to produce electricity from renewable energy sources (RES) or in a high-efficiency cogeneration of electricity and useful heat (CHP) first has to file an application to obtain a declaration for the production facility with the Energy Agency of the Republic of Slovenia. The procedure for obtaining support for new production facilities or the procedure for the renewal of the support (in the cases of the entities formerly called qualified producers) mainly depends on the age of the production facility for which the producer would like to receive support. The Second National Energy Efficiency Action Plan 2011-2016 sets out the strategy for a positive development of the Slovenian energy market and includes provisions on funding for the promotion of renewable energy and also points towards the increasingly energy and CO₂ efficient development of the country.

Share of energy sources used to satisfy heat demand in the residential, services and other sectors

District Heating	14.0 %
Natural gas	17.0 %
Electricity	6.0 %
Oil / Petroleum products	28.1 %
Renewables and others	33.1 %
Others	1.8 %

Existing barriers to the expansion of DH

One of the main reasons that new investments in District Heating have been put on hold is the on-going economic crisis, which has led to the high cost of borrowing, as well as an undefined District Heating policy at the national and local levels. The new expected update of the Energy Act and the new National Energy Programme for the

period up to 2030, which will come into force in early 2013, will have an impact on the development and expansion of District Heating in the Republic of Slovenia.

National planning and construction issues

There are national requirements for the use of heat from renewables in new buildings. The energy performance of the building is achieved if at least 25% of the total final energy consumption for the operation of systems in a building provided by the use of renewable energy in the building.

National solar support measures

There exist subsidies for solar thermal energy.

Maximum co-financing is from 200 to 300 k€:

- 10% of total costs for public companies
- 30% of total costs for large companies
- 40 % of total costs for medium size companies
- 50% of total costs for small size companies

For individual owners the subsidies for solar thermal is to 25% of the investment costs.

National interfaces between solar heat and district heating systems

It is not possible to sell solar heat into existing district heating systems (unless the owner or distributor owns also solar source), nor to transfer heat (third party supplier to a specific customer) in the district heating systems in Slovenia.

The main alternatives to solar heat are waste heat (from CHP, etc.) and heat from fossil and wood fuel and straw boilers. The price of heat in DH systems vary from 35 to 100 €/MWh.

Solar district heating systems are commonly applied in small to medium size individual heating systems, but are not connected to DH.

8. SPAIN

National planning and construction issues

Depending on the climatic zone, there are 5 different climatic zones in Spain, depending of the available solar radiation and temperatures; there is a specific percentage that has to be covered by renewable energy, but just for domestic hot water. It varies from the 30% in the north, to the 70% in the south.

According to the legislation, the specific percentage of DHW that has to be covered by renewable has to be covered by solar thermal, but is possible to cover that percentage with any other renewable if it is argued that is possible to reduce the energy consumption and CO2 emissions at the same percentage.

There is no experience, especially in the installation and maintenance of large scale solar thermal plants in Spain. Also a price of land can be a barrier for SDH development.

National solar support issues

There are investments grants for solar thermal plants in some regions in Spain. Mentioned support schemes are also applicable for SDH.

National interfaces between solar heat and district heating systems

There are almost no DH networks in Spain, most of them are small DH networks. There is one medium DH network in Barcelona with supply temperature of 95-90°C, at these moment the DH operator is buying heat from the waste incineration plant at 0,015 - 0,020 €/kWh, it could be possible to sell solar heat but not economically feasible.

APPENDICES

8.1. Questionnaires

8.1.1. Croatia

1. National planning and construction issues

- a) What general demands appear in your national, regional or local legislation for new building developments with respect to renewable heat supply?**

For new building developments, it's obligatory to include analysis of technical, ecology and economy feasibility of application of decentralized RES, cogeneration, district heating and cooling, heat pumps or fuel cells. The investor is requested to revise alternative systems and technical solutions, but application of these systems is not obligatory.

- b) What specific demands appear in your national, regional or local legislation for new building developments with respect to solar heat supply?**

The same as the above applies; no specific demands for solar heat supply exist.

- c) Can you identify some barriers to get access to land or land areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers?

Application on historic or protected areas.

- d) Can you identify some barriers to get access to roofs or roof areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers?

Application on historic or protected areas.

- e) Who have so far taken initiatives for solar district heating in your country?**

- Housing companies
 District heating companies/utilities
 Municipalities

- Energy Service Companies (ESCO's)
- Others

f) Are the availability of manpower and capacity satisfactory with respect to planning, design and construction of large solar heat supply systems?

- Yes
- No

If No: What is lacking?

Generally, there is insufficient interest of the workforce due to the undeveloped market as a consequence of the ignorance of designers/planners regarding new RES technologies and their role in introducing them.

2. National solar support measures

a) Does your county have general financial incentives for renewable heat supply?

- Yes
- No

If Yes:

- Investment grants Type/amount:
- Tax reduction Type/amount:

- Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

- Yes
- No

b) Does your country have special financial incentives for solar heat supply?

- Yes
- No

If Yes:

- Investment grants Type/amount: So far, only occasional investment grants of limited scope for solar thermal collectors for households are organized on municipal/local/regional level. The incentives per installation usually amount to 40% of the investment and installation costs (e.g. max EUR 1600 in Karlovac County, tender in 2011).

Tax reduction Type/amount:

Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

Yes

No

3. National interfaces between solar heat and district heating systems.

Access to the district heating systems.

a) Is it possible to sell heat into district heating systems?

Yes

No

b) Can net metering be applied when solar heat is fed into district heating systems?

Yes

No

c) Can solar heat be transferred in a district heating system from a supplier to a customer?

Yes

No

Economics – Alternative heat supply.

d) What is the typical heat supply during the summer season?

Waste incineration without CHP

Waste incineration with CHP

Coal CHP

Gas CHP

Biomass CHP

Natural gas boiler

Heating oil boiler

Biomass boiler

Other

If Other, what?

e) What is the corresponding running cost for heat generation during the summer season?

40 – 50 EUR/MWh for Gas CHP

65 – 85 EUR/MWh for local boiler plants depending on the type of fuel

Technical – Performance

f) Solar heat supply is temperature dependant. What is the typical annual average temperature in the district heating systems?

< 40 °C

40 - 50 °C

50 - 60 °C

60 - 70 °C

>70 °C

Here you can write complementary comments to the subject or your answers with your own words...

Please note that currently a new Act on Heat market is in the pipeline that will enable market mechanisms to take place. However, at the time of writing this report, it is difficult to foresee the impact this new Act will have on the district heating sector (including the introduction of solar district heating) in the years to come.

Questionnaire filled by:

Country: Croatia

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Send filled in questionnaire to David.Borovsky@afconsult.com

8.1.2. France

1. National planning and construction issues**a) What general demands appear in your national, regional or local legislation for new building developments with respect to renewable heat supply?**

- French building thermal regulation ("RT2012"): a minimum share of renewable energy for heat demand is required for single family houses; connection to a low carbon emission DH can increase the maximum heat demand up to 30%, hence reducing the building cost.
- tax incentives for social housing sector (preferential loans from public money if Renewables are present at a minimum level)
- local authorities can increase the authorised building surface for land owners in some areas if they use RES.

b) What specific demands appear in your national, regional or local legislation for new building developments with respect to solar heat supply?

Local authorities sometimes set energy performance requirements, including RES requirements for new ecodistricts. The local political will to have solar on new ecodistrict is fairly common, as this RES has a very good image.

There are specific incentives for investment in some regions or town for solar heat.

In overseas territories: obligation to install solar systems for DHW preparation in single family houses. Enlargement of this obligation to some collective buildings having a minimum of DHW load.

c) Can you identify some barriers to get access to land or land areas for solar heat supply (i.e. for solar collectors)?

- Yes
 No

If Yes: Which barriers?

- planning of land use in each town: some areas are protected
- land use securisation: a significant share of French territory is considered as a land usable for agricultural purposes. This classification leads to a very difficult possibility for solar collector field implementation. In some cases, like for PV plants, this is purely forbidden.

- land price which can be very high as soon as it is close to city centers. This is due to the speculation dimension of these lands value. Indeed, even if not classified to be buildable now, it can become buildable in a near future and then have its value multiplied by 20 to several hundreds
- risk of vandalism in certain places where it is necessary, in addition to acquire the land, to secure it with costly measures

d) Can you identify some barriers to get access to roofs or roof areas for solar heat supply (i.e. for solar collectors)?

- Yes
 No

If Yes: Which barriers?

- French Law regarding the property of the roofs and the easiness for renting it for a long period
- Responsibilities in case of water leakage due to the solar collector field implementation
- Risk of early refurbishment of the building and of its roofs in a shorter period than the solar collector field amortization

e) Who have so far taken initiatives for solar district heating in your country?

- Housing companies
 District heating companies/utilities
 Municipalities
 Energy Service Companies (ESCO's)
 Others: R&D institutes, solar system manufacturer

f) Are the availability of manpower and capacity satisfactory with respect to planning, design and construction of large solar heat supply systems?

- Yes
 No

If No: What is lacking?

Lack of skill, sometimes in design or when installing systems which are too complex;

Lack of market volume permitting to create a dynamic competition between several skilled installing companies for such large systems.

Lack of habit to work on low temperature DH and low temperature heating system in general.

2. National solar support measures

a) Does your county have general financial incentives for renewable heat supply?

- Yes
 No

If Yes:

- Investment grants Type/amount: Fonds Chaleur grant program – around 230 M€ per year dedicated to renewable heat (all technologies)
- Tax reduction Type/amount: VAT at 5,5% instead of 19,6% for heat sold from a DH using at least 50% of renewable or waste heat; Income tax reduction on individual solar systems.

Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

- Yes for VAT
 No for grants

b) Does your country have special financial incentives for solar heat supply?

- Yes
 No

If Yes:

- Investment grants Type/amount: Fonds Chaleur grant program
- Tax reduction Type/amount:

Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

- Yes but called Fonds Chaleur NTE grant program for new technology (only one call in 2013 and no information for the coming years) – around 2 M€ per year for all new technologies.
- No

3. National interfaces between solar heat and district heating systems.

Access to the district heating systems.

a) Is it possible to sell heat into district heating systems?

- Yes currently used for energy from waste incineration or some gas or biomass CHP units
- No

b) Can net metering be applied when solar heat is fed into district heating systems?

- Yes in theory but not done yet in practice
- No

c) Can solar heat be transferred in a district heating system from a supplier to a customer?

- Yes
- No

Economics – Alternative heat supply.

d) What is the typical heat supply during the summer season?

- Waste incineration without CHP
- Waste incineration with CHP
- Coal CHP
- Gas CHP
- Biomass CHP
- Natural gas boiler
- Heating oil boiler
- Biomass boiler
- Other
- If Other, what?

e) What is the corresponding running for heat generation during the summer season?

There are two typical strategies during Summer time:

- to fully switch off the net and then rely on local backups only for DHW (some rare cases especially in small biomass DH)
- to partially or totally switch off some heat production units but keeping DH running at a low power level for DHW and other remaining demands (industrial for example). In this case, when there is waste incineration heat, it is used first and can be the only heat source during summer.

The heat costs in summer are quite different between energies:

- waste incineration, fuel oil and wood heat cost are generally steady through the year. The heat sold to a DH is :
 - o from 10 to 40 €/MWh for waste incineration (average 25)
 - o from 20 to 50 €/MWh for wood (average 25 for forest chips ; 50 for pellets)
- natural gas is cheaper in summer than in winter. In France, regulated prices for electricity and gas, which are still widely used by domestic costumers, can make it tougher for other energies to compete on an economical point of view (86% of the gas consumption from residential consumers is bought on regulated prices; only 26% for professional consumers).

The price of gas is 30% cheaper (40 €/MWh instead of 57 €/MWh in 2013) in summer (1/04 from 31/10) for professional consumers (including social housing with collective heating) using regulated prices, but the price of gas is the same all the year for residential consumers. Of course, for DH operators buying the gas on the energy market, the gas is generally cheaper in summer than in winter. Heat generation cost from gas boiler on DH is around 30 €/MWh in summer.

Technical – Performance**f) Solar heat supply is temperature dependant. What is the typical annual average temperature in the district heating systems?**

- < 40 °C
- 40 - 50 °C
- 50 - 60 °C
- 60 - 70 °C
- >70 °C

Here you can write complementary comments to the subject or your answers with your own words...

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8.1.3. Lithuania

1. National planning and construction issues

- a) What general demands appear in your national, regional or local legislation for new building developments with respect to renewable heat supply?**

Renovated buildings have to meet the requirement of D energy efficiency class until 1 January 2014.

All new buildings have to meet the requirement of B energy efficiency class after 1 January 2014.

Primary share of renewable energy determinate the buildings energy efficiency class.

- b) What specific demands appear in your national, regional or local legislation for new building developments with respect to solar heat supply?**

No specific demands appear in legislation for new buildings developments with respect to solar heat supply.

- c) Can you identify some barriers to get access to land or land areas for solar heat supply (i.e. for solar collectors)?**

Yes

No

If Yes: Which barriers?

Free large areas of land near district heating companies' territories.

- d) Can you identify some barriers to get access to roofs or roof areas for solar heat supply (i.e. for solar collectors)?**

Yes

No

If Yes: Which barriers?

Residents are homeowners of the block buildings. Least 50 homeowners are in one residential building. It is problem.

Public or industrial building has one owner in usually.

- e) Who have so far taken initiatives for solar district heating in your country?**

- Housing companies
- District heating companies/utilities
- Municipalities
- Energy Service Companies (ESCO's)
- Others

f) **Are the availability of manpower and capacity satisfactory with respect to planning, design and construction of large solar heat supply systems?**

- Yes
- No

If No: What is lacking?

2. National solar support measures

a) **Does your county have general financial incentives for renewable heat supply?**

- Yes
- No

If Yes:

Investment grants Type/amount: Biomass boiler or CHP biomass installations are supported by EU and national government.

Tax reduction Type/amount: 9 % of VAT for all centralized heat supply.

Others Type/amount: District heating networks operators are obligated to buy renewable heat if it is cheaper than the heat produced from other fuel.

If Yes: Is the support measure also applicable for solar district heating?

- Yes
- No

There is no such practice for solar district heating. 9 % of VAT for all centralized heat supply.

b) Does your country have special financial incentives for solar heat supply?

Yes

No

If Yes:

Investment grants

Type/amount:

Tax reduction

Type/amount:

Others

Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

Yes

No

3. National interfaces between solar heat and district heating systems.

Access to the district heating systems.

a) Is it possible to sell heat into district heating systems?

Yes

No

b) Can net metering be applied when solar heat is fed into district heating systems?

Yes

No

c) Can solar heat be transferred in a district heating system from a supplier to a customer?

Yes

No No practice. District heating networks operators sell heat to consumers.

Economics – Alternative heat supply.

d) What is the typical heat supply during the summer season?

Waste incineration without CHP

- Waste incineration with CHP
- Coal CHP
- Gas CHP
- Biomass CHP
- Natural gas boiler
- Heating oil boiler
- Biomass boiler
- Other
- If Other, what?

e) **What is the corresponding running for heat generation during the summer season?**

Technical – Performance

f) **Solar heat supply is temperature dependant. What is the typical annual average temperature in the district heating systems?**

Heat supply temperature is about 70 C in summer load and about 100 C in winter load. Return water temperature is about 40 C summer load and about 50 C in winter load.

- < 40 °C
- 40 - 50 °C
- 50 - 60 °C
- 60 - 70 °C
- >70 °C

Here you can write complementary comments to the subject or your answers with your own words...

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8.1.4. Poland

1. National planning and construction issues

a) **What general demands appear in your national, regional or local legislation for new building developments with respect to renewable heat supply?**

- Renewable energy heat may decrease the total annual energy demand for new building (renewable heat decreases the total use of energy)
- There is an obligation for analysis of renewable heat supply option in new buildings.

b) **What specific demands appear in your national, regional or local legislation for new building developments with respect to solar heat supply?**

- Solar heat is considered as one of the renewable heat options.

c) **Can you identify some barriers to get access to land or land areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers?

- Limited roof surface in the urban areas.

d) **Can you identify some barriers to get access to roofs or roof areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers?

e) **Who have so far taken initiatives for solar district heating in your country?**

- Housing companies
 District heating companies/utilities
 Municipalities
 Energy Service Companies (ESCO's)
 Others

f) **Are the availability of manpower and capacity satisfactory with respect to planning, design and construction of large solar heat supply systems?**

- Yes
 No

If No: What is lacking?
Lack of practice and knowledge of solar district heating systems designers.

2. National solar support measures

a) Does your county have general financial incentives for renewable heat supply?

- Yes
 No

If Yes:

- Investment grants Type/amount:
 Tax reduction Type/amount:
 Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

- Yes
 No

b) Does your country have special financial incentives for solar heat supply?

- Yes
 No

If Yes:

- Investment grants Type/amount: payment to a bank loan for the solar installation with the maximum amount equivalent to 2250 PLN per m² of installed collectors aperture (2250 PLN/m² x # m²)
 Tax reduction Type/amount:
 Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

- Yes

No

3. National interfaces between solar heat and district heating systems.
Access to the district heating systems.

a) Is it possible to sell heat into district heating systems?

Yes

No

b) Can net metering be applied when solar heat is fed into district heating systems?

Yes

No

c) Can solar heat be transferred in a district heating system from a supplier to a customer?

Yes

No

Economics – Alternative heat supply.

d) What is the typical heat supply during the summer season?

Waste incineration without CHP

Waste incineration with CHP

Coal CHP

Gas CHP

Biomass CHP

Natural gas boiler

Heating oil boiler

Biomass boiler

Other

If Other, what?

e) What is the corresponding running for heat generation during the summer season?

- Coal CHP 37 EUR/MWh
- Heating oil boiler 110 EUR/MWh
- Natural gas boiler 61 EUR/MWh

- Biomass CHP 42 EUR/MWh

**referring to typical household*

Source: www.viessmann.zgora.pl/ABC_ogrzewania_Porownanie_kosztow_ogrzewania.html

Technical – Performance

f) **Solar heat supply is temperature dependant. What is the typical annual average temperature in the district heating systems?**

- < 40 °C
- 40 - 50 °C
- 50 - 60 °C
- 60 - 70 °C
- >70 °C

Here you can write complementary comments to the subject or your answers with your own words...

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8.1.5. Slovenia

1. National planning and construction issues

- a) **What general demands appear in your national, regional or local legislation for new building developments with respect to renewable heat supply?**

The energy performance of the building is achieved if, at least 25 % of the total final energy consumption for the operation of systems in a building provided by the use of renewable energy in the building.

- b) **What specific demands appear in your national, regional or local legislation for new building developments with respect to solar heat supply?**

Hot water is generally provided by solar panels or alternative systems using renewable energy sources.

- c) **Can you identify some barriers to get access to land or land areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers?

- d) **Can you identify some barriers to get access to roofs or roof areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers?

- e) **Who have so far taken initiatives for solar district heating in your country?**

- Housing companies
 District heating companies/utilities
 Municipalities
 Energy Service Companies (ESCO's)
 Others

- f) **Are the availability of manpower and capacity satisfactory with respect to planning, design and construction of large solar heat supply systems?**

- Yes
 No

If No: What is lacking?

2. National solar support measures

c) Does your county have general financial incentives for renewable heat supply?

- Yes
 No

If Yes:

- Investment grants Type/amount: subsidies from cohesion
(30% large companies, 40% medium companies, 50% small companies)
 Tax reduction Type/amount:

 Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

- Yes
 No

Such measures have been written in strategy, but no tender has been ever launched for SDH, only for biomass DH.

d) Does your country have special financial incentives for solar heat supply?

- Yes
 No

If Yes:

- Investment grants Type/amount: 25% of investment however:

For maximum 20 m² solar collectors for individual apartment, maximum 150€ per m² of flat plate collectors and maximum 200 € per m² vacuum collector. Self standing units – 75€/m²

Tax reduction Type/amount:

Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

Yes

No

3. National interfaces between solar heat and district heating systems.

Access to the district heating systems.

g) Is it possible to sell heat into district heating systems?

Yes

No

h) Can net metering be applied when solar heat is fed into district heating systems?

Yes

No

i) Can solar heat be transferred in a district heating system from a supplier to a customer?

Yes

No

Depends on system

Economics – Alternative heat supply.

j) What is the typical heat supply during the summer season?

Waste incineration without CHP

Waste incineration with CHP

Coal CHP

Gas CHP

Biomass CHP

Natural gas boiler

- Heating oil boiler
- Biomass boiler
- Other
- If Other, what?

k) What is the corresponding running for heat generation during the summer season?

N.A.

Technical – Performance

l) Solar heat supply is temperature dependant. What is the typical annual average temperature in the district heating systems?

- < 40 °C
- 40 - 50 °C
- 50 - 60 °C
- 60 - 70 °C
- >70 °C

Here you can write complementary comments to the subject or your answers with your own words...

Questionnaire filled by: dr. Andrej Kitanovski

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8.1.6. Spain

1. National planning and construction issues

- a) What general demands appear in your national, regional or local legislation for new building developments with respect to renewable heat supply?**

Depending on the climatic zone, there are 5 different climatic zones in Spain, depending of the available solar radiation and temperatures; there is a specific percentage that has to be covered by renewable energy, but just for domestic hot water. It varies from the 30% in the north, to the 70% in the south

- b) What specific demands appear in your national, regional or local legislation for new building developments with respect to solar heat supply?**

According to the legislation, the specific percentage of DHW that has to be covered by renewable has to be covered by solar thermal, but is possible to cover that percentage with any other renewable if it is argued that is possible to reduce the energy consumption and CO2 emissions at the same percentage.

- c) Can you identify some barriers to get access to land or land areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers? Land is very expensive and limited space availability.

- d) Can you identify some barriers to get access to roofs or roof areas for solar heat supply (i.e. for solar collectors)?**

- Yes
 No

If Yes: Which barriers?

- e) Who have so far taken initiatives for solar district heating in your country?**

- Housing companies
 District heating companies/utilities

- Municipalities
- Energy Service Companies (ESCO's)
- Others

f) Are the availability of manpower and capacity satisfactory with respect to planning, design and construction of large solar heat supply systems?

- Yes
- No

If No: What is lacking? There is no experience, especially in the installation and maintenance of big solar thermal plants.

2. National solar support measures

e) Does your county have general financial incentives for renewable heat supply?

- Yes (but only in some regions)
- No

If Yes:

- Investment grants Type/amount: percentage of the investment cost
- Tax reduction Type/amount:
- Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

- Yes
- No

f) Does your country have special financial incentives for solar heat supply?

- Yes (but only in some regions)
- No

If Yes:

- Investment grants Type/amount: 30% of investment in solar thermal panels

Tax reduction Type/amount:

Others Type/amount:

If Yes: Is the support measure also applicable for solar district heating?

Yes

No

3. National interfaces between solar heat and district heating systems.

Access to the district heating systems.

m) Is it possible to sell heat into district heating systems?

Yes

No

n) Can net metering be applied when solar heat is fed into district heating systems?

Yes

No

o) Can solar heat be transferred in a district heating system from a supplier to a customer?

Yes

No

Economics – Alternative heat supply.

p) What is the typical heat supply during the summer season?

Waste incineration without CHP

Waste incineration with CHP

Coal CHP

Gas CHP

Biomass CHP

Natural gas boiler (individual boilers)

Heating oil boiler

Biomass boiler

Other

If Other, what?

q) What is the corresponding running for heat generation during the summer season?

Technical – Performance

r) Solar heat supply is temperature dependant. What is the typical annual average temperature in the district heating systems?

< 40 °C

40 - 50 °C

50 - 60 °C

60 - 70 °C

>70 °C

Here you can write complementary comments to the subject or your answers with your own words...

There are almost no DH networks in Spain, most of them are small DH networks and it is very difficult to find someone interested in investing in solar DH, especially when the primary energy is so low, and so payback periods are too long.

There is one medium DH network in Barcelona with supply temperature of 95-90°C, at these moment the DH operator is buying heat from the waste incineration plant at 0,015-0,020€ per kWh, it could be possible to sell solar heat but not economically feasible.

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8.2. Questionnaires overview tables

	Croatia	France	Lithuania	Poland	Slovenia	Spain
1. National planning and construction issues						
a) What general demands appear in your national, regional or local legislation for new building developments with respect to renewable heat supply?	feasibility of decentralized RES in new buildings	a minimum share of RE for heat demand for single family houses	primary share of renewable energy determinate the buildings energy efficiency class	feasibility of decentralized RES in new buildings, renewable heat decreases the total use of energy	25 % of the total final energy consumption in a building from RES	specific percentage that has to be covered by renewable energy
b)*** What specific demands appear in your national, regional or local legislation for new building developments with respect to solar heat supply?	no specific demands	RES requirements for new ecodistricts, obligation to install solar systems for DHW in single family houses	no specific demands	Solar heat is considered as one of the renewable heat options	hot water is generally provided by solar panels or alternative systems using renewable energy sources.	pecific percentage of DHW that has to be covered by renewable has to be covered by solar thermal
c)*** Can you identify some barriers to get access to land or land areas for solar heat supply (i.e. for solar collectors)?	yes	yes	no	yes	no	yes
IF YES: Which barriers?	application on historic or protected areas.	planning of land use in each town, land use securisation, land price, risk of vandalism		limited roof surface in the urban areas.		land price
d)*** Can you identify some barriers to get access to roofs or roof areas for solar heat supply (i.e. for solar collectors)?	yes	yes	yes	no	no	no
IF YES: Which barriers?	application on historic or protected areas.	French Law regarding the property of the roofs	access on roofs of multifamily houses with higher number of owners			
e)*** Who have so far taken initiatives for solar district heating in your country? Housing companies District heating companies/utilities Municipalities Energy Service Companies (ESCO's) Others	+	+	+	+	+	
f)*** Are the availability of manpower and capacity satisfactory with respect to planning, design and construction of large solar heat supply systems?	no	no	yes	no	yes	no
IF NO: What is lacking?	there is insufficient interest of the workforce due to the undeveloped market	lack of skill, in design and installation. developed market, experience with low temperature DH		lack of practice and knowledge of solar district heating systems design-ers.		no experience, especially in the installation and maintenance of large solar thermal plants

	Croatia	France	Lithuania	Poland	Slovenia	Spain
2. National solar support measures						
a) Does your country have general financial incentives for renewable heat supply?	no	yes	yes	no	yes	yes
IF YES:						
Investment grants		+	+		+	+
Tax reduction		+	+			
Others						
If YES: Is the support measure also applicable for solar district heating?	-	only the tax reduction	only the tax reduction	-	yes/no	yes
b) Does your country have special financial incentives for solar heat supply?	yes	yes	no	yes	yes	yes
IF YES:						
Investment grants	+	+		+	+	+
Tax reduction						
Others						
If YES: Is the support measure also applicable for solar district heating?	no	only new technology	-	no	no	yes

	Croatia	France	Lithuania	Poland	Slovenia	Spain
3. National interfaces between solar heat and district heating systems.						
a) Is it possible to sell heat into district heating systems?	yes	yes	yes	no	no	N.A.
b) Can net metering be applied when solar heat is fed into district heating systems?	no	yes	yes	no	yes	N.A.
c) Can solar heat be transferred in a district heating system from a supplier to a customer?	no	no	no	no	yes/no	N.A.
d) What is the typical heat supply during the summer season?						
Waste incineration without CHP		+				
Waste incineration with CHP		+				
Coal CHP				+	+	
Gas CHP	+				+	
Biomass CHP				+		
Natural gas boiler	+	+		+	+	+
Heating oil boiler					+	
Biomass boiler		+	+	+		
Other						
If Other, what?						
e) What is the corresponding running for heat generation during the summer season?	Gas CHP 40 - 50 EUR/MWh, Local boiler plants 65 - 85 EUR/MWh	Waste incineration 10 - 40 €/MWh, Wood 20 - 50 €/MWh, Natural gas 30 €/MWh	N.A.	Coal CHP 37 EUR/MWh, Heating oil boiler 110 EUR/MWh, Natural gas boiler 61 EUR/MWh, Biomass CHP 42 EUR/MWh	N.A.	N.A.
f) Solar heat supply is temperature dependant. What is the typical annual average temperature in the district heating systems?						
< 40 °C						
40 - 50 °C						
50 - 60 °C						
60 - 70 °C	+					
>70 °C	+	+	+	+	+	+