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Acronym: RES H/C SPREAD
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Compilation and Analysis of Good-Practice Examples of Policies and Measures Promoting Heating and Cooling from Renewables

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# Table of contents

Executive Summary.............................................................. 3  

1. Development of criteria for Screening........................................ 5  
   Background for development of criteria: Diffusion of Innovations ............ 5  

2. Development, dissemination and evaluation of questionnaires .......... 10  

3. Documentation of good practices ........................................... 12  
   Summary of findings ........................................................... 12  
   Findings Austria ................................................................. 15  
   Findings Bulgaria ............................................................... 23  
   Findings Greece ................................................................. 26  
   Findings Italy .................................................................... 31  
   Findings Latvia ................................................................. 36  
   Findings Spain ................................................................. 41
Executive Summary

The objective of this report is to identify and examine good practice examples of effective measures and strategies for the promotion of heating and cooling with renewables (RES H/C) in different EU member states, which can be transposed into other contexts.

For this purpose, this report contains a summary of 32 interesting RES H/C examples and measures in Austria, Bulgaria, Italy, Greece, Latvia and Spain. These best-practice examples have been collected using a questionnaire developed on the basis of the model “Diffusion of Innovations”. More than 60 key-stakeholders have been interviewed in order to get detailed information on the status of RES H/C in the participating countries. Moreover, 4 best-practice examples have been collected from Germany, the Netherlands, Sweden and the UK on the basis of a literature review. In both cases, the selection was based on transparent criteria and procedures (replicable technology, market maturity etc.).

Furthermore, a qualitative assessment of the promotion of RES H/C in in Austria, Bulgaria, Italy, Greece, Latvia and Spain has been performed on the basis of the interviews with key-stakeholders and an extensive literature research.

The main findings are outlined in the following table. The colours demonstrate the qualitative assessment performed, where the numbers refer to the numbers of best practice examples per category (according to the model "Diffusion of Innovations") and country:

<table>
<thead>
<tr>
<th>&quot;Diffusion of Innovations&quot;: Categories of policy implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy Framework</td>
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<tr>
<td>------------------</td>
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<tr>
<td>RES H/C Project</td>
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<tr>
<td>Austria</td>
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<tr>
<td>Bulgaria</td>
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<td>Greece</td>
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<tr>
<td>Italy</td>
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<tr>
<td>Latvia</td>
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<tr>
<td>Spain</td>
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<tr>
<td>Germany</td>
</tr>
<tr>
<td>Netherlands</td>
</tr>
<tr>
<td>Sweden</td>
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<tr>
<td>UK</td>
</tr>
</tbody>
</table>

n=36 best-practice examples; Green: good; Yellow: average; Red: actions needed

The results show that there are big differences regarding the policy framework of RES H/C in the member states currently under study. Spain and Bulgaria in particular, should make improvements in this direction. In general, the policy framework has shown to be essential for the market development of innovative technologies. It may also happen that, even without a well-defined RES policy framework, there is implementation of RES H/C, as the example of Bulgaria shows (impressive growth despite poor policy framework). In fact, this may lead to a fragmented and inefficient use of the available resources.

There are different implementing agencies in place, which manage the implementation process of RES H/C, like biomass associations, consultancy companies, etc. These institutions keep political decision makers informed about needs and successes. Although the agencies are not homogeneous in the member states, they fulfil their intended function. Moreover, the interviews have shown that technology aspects can be improved in all member states. Even in
Austria, a country with a very long tradition in RES-heat, the quality of installations has to be enhanced. Quality standards for the implementation of technologies are generally needed; some are already in place, but not all of them are securely applied. The analysis of incentives and other cost aspects regarding RES H/C yields an uneven picture. There are different direct and indirect incentives in place. Furthermore, support-systems often create trust in technologies. An interesting outcome is that many participants of the survey stated this to be more important than the absolute amount of financial support. Finally, all countries rely on information exchange (websites, events, awareness-campaigns etc.).

It turned out that it is difficult to draw generally acceptable conclusions due to local differences. For regional planning, it is therefore essentially important to focus on regional conditions. Nevertheless, important recommendations can be made in order to develop regional RES H/C plans:

- Information exchange seems to be one of the key success factors for RES H/C technologies’ implementation. Many of the stakeholders stated that information is even more important for the implementation of technologies than the level of incentives, at least in the case of small scale RES H/C technologies (e.g. pellet boilers). Furthermore, the public should be informed that RES H/C is not just environmentally friendly, but can also be economically competitive. Demonstration activities of new renewable energy technologies are important in order to support the implementation and should be disseminated accordingly.

- Support systems create trust in technologies. This is very important for the acceptance of new, innovative technical applications. Of course, the general policy framework is also essential for the market development of innovative technologies.

- Quality standards for this implementation are generally needed. An implementing agency (“change agent”) has to manage the whole process. It designs and carries out training-courses for plumbers and planers, produces information material for investors, proposes legal regulations, informs producers about the needs of investors, takes care of quality control, etc. Moreover, the quality of financial incentives has to be ensured through a constant evaluation of the effectiveness. Feedback as well as the inclusion of relevant stakeholders is also important in this context.

- The impact of programs promoting the use of RES H/C can be increased enormously, when they are embedded into an existing energy- and climate policy strategy. If so, the instruments can support each other and the existing synergies can be utilized.

- Regarding financial incentives, it is essentially necessary to have a strong backing from the legislative authority. Long-term planning security is of great importance in this context. Investments in RES H/C are often dependent on a stable and predictable policy framework.

- It is not sufficient to offer financial support as a stand-alone measure. A targeted mix of policies and measures like the combination of incentives with additional measures, such as training, awareness-raising, and research and technology development, is often more promising.

- Municipalities are often highly motivated and therefore crucial for the overall promotion of RES H/C. Awareness-raising, communication of best-practices, as well as long-term strategies are the main points of success. Awards can be an additional motivation for municipalities and can also provide a positive image which can be used in marketing.

- The existence and availability of “software-aspects”, like technical knowledge (plumbers, installers etc.), is of great importance for the successful implementation of RES H/C technologies.
1. Development of criteria for Screening

In order to evaluate good practices, a set of criteria for screening is necessary. Important aspects include the geographical scope, target groups, legislative and financial instruments applied as well as key lessons learned. Furthermore, synergies between RES policies/technologies and energy efficiency policies/technologies have to be considered.

In accordance to the requirements mentioned above, the criteria for screening were developed out of the model of “Diffusion of Innovations” (Rogers, 1995).

Background for development of criteria: Diffusion of Innovations

Renewable energy systems, like any other innovation, do not automatically find their way to the market. They have to compete with existing structures, mostly based on fossil fuels, which are strengthened by decades of proof of market and which are in many cases cheaper than the systems based on renewable sources. To enable an investor or consumer to carry out an investment in a renewable energy system (or more generally: a respective behaviour), this investor/consumer has

- to have the ability to carry out the very investment, and he
- has to be motivated to do so.

The main concern of diffusion is a technology which is wanted to be implemented. The RES H/C SPREAD project focuses on technologies which are already mature in the way that they have been successfully demonstrated both technically and economically (proof of market). The focus is not on the inception-phase of the technology, but on the phase of mass-deployment. This is important, because it restricts the type of policy-measures under consideration: In the early R&D-phase of a technology development, policies will concentrate on technology-push. In the inception- and take-off-phase, policies move to market-pull (IEA, 2010, p 34, see also Figure 2).

A technology consists of

- a hardware aspect, this is a tool that embodies the technology as a material or physical object (a biomass-boiler, but also existing chimney if individual heating systems are concerned, a hydraulic system for water-distribution, etc.), and
- a software aspect, consisting of information related to the hardware (the expertise of plumbers who install this boiler, or the knowledge of architects, engineering-consultants, housing associations etc.) (Rogers, 1995).

- For energy technologies, often a fuel, or, more generally, a resource, is needed for operation which again consists of hard- (pellets) and software (fuel-trader) aspects and deserves separate emphasis. The resource could also be a heat-reservoir for geothermal utilization or any other low-enthalpy source.

- Investors are encouraged by the following two enabling elements an element which concerns incentives. Practically, it would address cost-aspects for the technology (subsidies, tax releases,…), but also fiscal policies like tax-exemptions, carbon taxes on the competing fossil fuels, or pricing policies like feed-in-tariffs etc. People change their behaviour according to incentives.
• a segmented and adjusted information-system referring to all aspects of the technology, to the available elements addressing cost-aspects and incentives, containing also motivational information like climate-change facts, import-dependency of the energy-system etc.. The information-system changes its shape, the more potential investors have to be addressed (the need for communication increases from process-heat for industry to individual heating systems for households).

**Incentives, Financing, cost-aspects**

Incentives can have different forms, as shown in the following table:

<table>
<thead>
<tr>
<th>Incentives, financing, cost-aspects</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>New business models</td>
<td>Public civic participation</td>
</tr>
<tr>
<td></td>
<td>Cooperatives with participation of heat-suppliers only, or both suppliers and consumers</td>
</tr>
<tr>
<td>Fiscal policies</td>
<td>Carbon tax</td>
</tr>
<tr>
<td></td>
<td>Tax reductions and -exemptions (for manufacturing sector, installers,...)</td>
</tr>
<tr>
<td></td>
<td>Grants, subsidies for investment and / or for exploitation costs, for first settlement, etc.</td>
</tr>
<tr>
<td>Pricing policies</td>
<td>Tariff beneficiaries/feed-in tariff</td>
</tr>
<tr>
<td>Quantitative policies</td>
<td>Obligations (in new buildings, public buildings,...)</td>
</tr>
<tr>
<td>Others</td>
<td>like public participation as shareholders of energy plants in permanent or temporary schemes</td>
</tr>
</tbody>
</table>

To establish all these elements, the
• **policy framework** has to be formed accordingly. This can, and practically does, take place at European (e.g. Directive 2009/28/EC), national, regional and local levels. Shaping of the policy frame would keep distances and transactions short, and it has to take care for the establishment of all the necessary elements of the diffusion-system (Figure 1). Among them are renewable energy directive and -action plan, financing of a subsidy-scheme for investments, regulations giving priority to renewable energy etc.

Central to the implementation-scheme is
• an **implementing agency**, usually called **change agent**, which manages the whole implementation-process. It keeps political decision-makers informed about needs and successes, designs and carries out training-courses for plumbers and planners, produces information-material for investors, proposes legal regulations, informs hardware-producers about needs of investors, takes care for quality-control etc. It can be placed on different levels of administration, meaning national, regional or local. Its activities can be dedicated to one very technology (e.g. solar thermal energy) or to many (e.g. renewables in general).

In total, the implementation-system will lead to an investor or consumer, who is enabled and motivated to implement and operate the respective wanted technology.
Technologies concerned

Renewable heat is heat generated from a renewable source of energy which is defined as “energy that is derived from natural processes that are replenished constantly” in the Energy Statistics manual from the IEA and Eurostat (IEA, 2012).

Principally, the following RES H/C technologies can be taken into consideration:

<table>
<thead>
<tr>
<th>Technology</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small scale biomass heating</td>
<td>Logwood-stoves</td>
</tr>
<tr>
<td></td>
<td>Tiled stoves</td>
</tr>
<tr>
<td></td>
<td>Logwood boilers</td>
</tr>
<tr>
<td></td>
<td>Small woodchip boilers</td>
</tr>
<tr>
<td>Small woodchip boilers</td>
<td>Pellet boilers</td>
</tr>
<tr>
<td>Pellet boilers</td>
<td>Pellet-stoves</td>
</tr>
<tr>
<td>Big scale biomass heating</td>
<td>For process heat</td>
</tr>
<tr>
<td></td>
<td>For big buildings</td>
</tr>
<tr>
<td>Liquid biomass</td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td>Direct heating by biogas</td>
</tr>
<tr>
<td></td>
<td>Waste heat from biogas - CHP</td>
</tr>
<tr>
<td></td>
<td>Virtual biogas from biogas upgraded to Methane and injected</td>
</tr>
<tr>
<td></td>
<td>into natural gas grid</td>
</tr>
<tr>
<td>District heating (DH) based on</td>
<td>Biomass</td>
</tr>
<tr>
<td></td>
<td>Municipal solid waste</td>
</tr>
<tr>
<td></td>
<td>Biogas CHP</td>
</tr>
<tr>
<td></td>
<td>Others, for example supported by solar thermal, heat pump,</td>
</tr>
<tr>
<td></td>
<td>geothermal etc.</td>
</tr>
<tr>
<td>Solar thermal heating and cooling</td>
<td>Low temperature heating</td>
</tr>
<tr>
<td></td>
<td>Medium and high temperature heating</td>
</tr>
<tr>
<td>Solar passive heating</td>
<td></td>
</tr>
<tr>
<td>Geothermal heating (shallow and</td>
<td>industrial processes,</td>
</tr>
<tr>
<td>deep)</td>
<td>space conditioning,</td>
</tr>
<tr>
<td></td>
<td>district heating</td>
</tr>
</tbody>
</table>
### Maturity of technology

The maturity of a technology depends on the phase of its commercial competitiveness. Principally, four different phases can be distinguished (see Figure 2).

The maturity of a technology can, additionally, be a function of geography. One and the same technology (for example solar thermal systems for hot water preparation) can be a mature technology in one country, while in the other being in an early state of market-deployment: this is mainly owing to the software-component of the technology (trained plumbers, skilled planners,...), while hardware-components can practically be traded and imported over a wide geographical area.

At different phases of the technology maturity pathway, which can be illustrated by an S-shaped curve (see Figure 2), different supportive policy-measures are required. In the early R&D-phase of a technology development (this early phase is **not being considered in the RES H/C project**!), policies will concentrate on technology-push, R&D etc., while in the inception- and take-off-phase, when the technologies have reached technical maturity (where the **focus of the RES H/C project** lies), policies move to market-pull.

<table>
<thead>
<tr>
<th>RES H/C SPREAD, Compilation and Analysis of Good-Practice Examples of RES H/C Policies and Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heat pumps using ambient heat</strong></td>
</tr>
<tr>
<td><strong>Waste heat from industrial processes, if (partly) from renewable sources</strong></td>
</tr>
<tr>
<td><strong>Renewable electricity for heat (direct use via electric resistor, and indirect use via heat pumps)</strong></td>
</tr>
<tr>
<td><strong>Systems- and supporting technologies</strong></td>
</tr>
<tr>
<td>Swimming pools, greenhouses, aquaculture ponds</td>
</tr>
<tr>
<td>Heat storage (diurnal, seasonal) Solar thermal supported other RES like biomass or geothermal district heating PV or wind, biogas etc. supported heat pump in low energy building</td>
</tr>
</tbody>
</table>

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End- and Demand-side actors

The principal actors in the RES-heat sector are private households and commercial consumers/investors. Their respective investment-decisions differ: while private consumers decide via simple payback-calculations or sometimes even against pure economic sensibility, commercial investors usually calculate a certain return on investment, however, they also take marketing-aspects into consideration (for example a big solar thermal system for a brewery in Austria, producing eco-friendly beer).

Literature:


2. Development, dissemination and evaluation of questionnaires

In order to obtain detailed information on the status of RES H/C in the participating countries, interviews with key-stakeholders were conducted. The main target groups were regional authorities and decision makers as well as experts operating in regional energy and/or environmental agencies in charge to set, design, develop and monitor regional energy plans. Moreover, local authorities were an important target group, too. At a country level, national ministries and agencies, regional coordination boards and municipalities associations have been selected for the interviews.

In a next step, a questionnaire has been designed in line with the development of criteria for screening. Two different versions have been developed:

- one long version for interviews with the key stakeholders and
- one simplified version of the same questionnaire for electronic dissemination.

All in all 61 important key-stakeholders from all of the consortiums’ member states have been interviewed either personally or by telephone.

Additionally, a simplified version has been developed and an online-survey has been conducted. The survey can be found at [http://www.res-hc-spread.eu/](http://www.res-hc-spread.eu/)

The questionnaire is based on the technology implementation system (figure 1), which has been presented to the interviewees in advance. The experts were then interviewed using the following open questions:

1. **Policy framework:**
   List national and regional policies relevant for RES-heat
   (The survey is restricted to currently active policies, which have a relevant impact on renewable heat technologies)

2. **Implementing Agency (Change agent)**
   Are there implementing agencies in place that take care for the diffusion of innovative technologies?
   Implementing agencies can be placed on different levels of administration and dedicate their efforts to different technologies.
   List implementing agencies with respect to a certain technology/technologies and their mode of operation.
   Refer to the ... model of technology diffusion and identify possible missing aspects of their activities.

3. **Technology**
   A technology consists of hardware and software aspects. For RES-heat technologies, special additional attention is on the fuel.
   List which parts of the technologies (hardware, software, fuel) are available and emphasize possible missing parts.

4. **Incentives, cost aspects**
   Which incentives are in place supporting the implementation of RES-heat technologies?
   Which demand side actors do they address? Private households? Commercial Investors? Public buildings?
Which RES-heat technologies are addressed? (see list of technologies in the sheet "Technology")
Type of policy measure (e.g. strategic document, indicative obligation, financial support (investment subsidy))

5. Information exchange
List which type of information exchange the respective change agents – or somebody else – carries out.

6. Implementation figures
Show details of a success of RES-heat implementation in your country or region.
Success Case (for example training courses for bioenergy-plumbers were the missing link for dissemination of small scale biomass heating systems; high rates for new installed boilers (pellets, logwood,...)):

7. Challenges which the further implementation of the technology faces/factors that could improve the success?
3. Documentation of good practices

Good practices were selected on the basis of fair and transparent criteria and procedures. One important aspect in this context is the repeatability. A special focus has been given to replicable technology, because a potential transfer to other countries is a crucial issue in the RES H/C SPREAD project. Furthermore, good practices shall be such within an existing and continuously working financial support-scheme, but shall also be close to proof of market. Therefore projects with claim of repeatability were chosen. Subsequently, their description is based on the structure of the questionnaire. The inputs from the expert interviews have been incorporated accordingly.

Summary of findings

1. Policy Framework

Policy frameworks have shown to be essential for the market-development of innovative technologies. Supportive schemes are in place in all countries surveyed in one or the other way. Financial support for investments is distributed from the EU-, the national and/or the regional levels. The federal structure of Austria with nine federal states and nine different support-systems for heat from RES, which additionally were improved over time, for example, allowed the development and identification of the best system by a fruitful competition between the different actors in the federal states. Greece has a program on “energy efficiency in household-buildings” in place, eligible for buildings in the public sector, which is open for all RES H/C technologies. The Italian “Renewable Energy for Heating and Cooling” program (”Conto termico”) supports both RUE- and RES-measures. In Bulgaria, there seems to be little support from the policy framework, despite that, there is substantial increase in the RES H/C. Latvia has one of the highest national targets for the share of renewables within the EU for 2020, namely 40%. With reference to the prominent role district heating plays in the country, a lot of direct and indirect support schemes and grants provide support for RES-use in district heating systems. In Spain, a high number of different framework-schemes for the respective energy technologies and for different actors (e.g. tourism, households, industry) are in place, they are active on national and regional levels.

2. Implementing Agencies (Change agent)

In some countries, the role of change agents is developed quite well, for example in Austria, where the national biomass association carries out change-agent-work for bioenergy, and also a solar-thermal change agent is in place. Such change agents have been in place for many years and carry out a lot of activities. Also in Italy there are these types of change-agents but their action is episodic and not coordinated at regional-central level. A good support may come from regional agents (like the case of the regional association of municipalities in Emilia Romagna) but it is mainly addressed to the local authorities. Also in Bulgaria, there are change agents in place, but there is a certain lack of coordination on a national level. In Latvia, the national investment- and development agency and the Latvian Environmental Fund are active change agents as well as engineering consultancy companies and relevant associations. In Greece, CRES as a competence-center is responsible for the technical coordination of implementation programs, providing consultancy to the municipalities. In Spain, where biomass, solar thermal energy, and geothermal systems are addressed by
different systems, a network of different change-agents led by local and regional agencies is related to these technologies. IDEA as a national agency refers to all RES-heat technologies.

3. Technology
The technologies surveyed concern renewable heat; they consist per definition of hard- and software aspects. All known technologies (biomass for heat, solar thermal, heat pumps etc.) are concerned in the one or the other country. In some countries (Spain, Austria), all these technologies are referred to.

Some countries, however, still face problems with the quality of the technology. In Latvia, for example, fuels (pellets) and installations of biomass-boilers are sometimes of poor quality. Even in Austria, a country with a very long tradition in RES-heat, the quality of installations has to be improved. Missing software-elements for the dissemination of technologies (energy managers for municipalities) were also reported from Bulgaria. Quality standards for the implementation of technologies are generally needed, some are already in place but not all of them are securely applied.

4. Incentives, cost aspects
Bulgaria has some indirect incentives implemented: a feed-in tariff for electricity from biomass, which indirectly supports CHP-based district-heat from biomass. The support-scheme of Greece finances energy audits and expenditures for consultancy, meaning hard- and software-measures. It was evaluated as very successful, the highest percentage of grant being 70%.

The Italian national tax-credit system (50% tax credit) resulted in high energy saving (9 TWh/year), but also in an uneven distribution of applicants: this type of measure is actually addressed to the households that can invest in energy saving interventions. The reduction of the tax-credit from i.e. 65% to 50% did not result in reduced number of projects, an observation, which corresponds with findings in Austria: Support-systems often do create trust in technologies, not only do they allow for financial feasibility of an investment in the technology. There seems to be a low elasticity of demand according to the amount of financial support.

Similar problems with the design of incentives were reported from Bulgaria: incentives (property tax exemption for buildings with RES) provided only after the realization of an investment do not solve a liquidity-problem, which is one of the main barriers.

In Spain, incentives for RES-E have been modified in the recent years. The changing situation often creates uncertainty among potentially new investors.

5. Information exchange
All countries rely on websites for information-distribution. Often information exchange is supported by events, information- and awareness-campaigns. If there is a change-agent in place, he usually takes also care for information exchange. Installers, who usually are the first contact-persons for potential investors, would need advice and trainings to carry out their work. In Austria, the neighborhood was important as a carrier of information, especially in the early phases of solar thermal technologies dissemination. In Italy, with reference to the tax credit measure, ENEA is carrying out (and continuously improving) a rather good service to support the households in their investment decisions.
6. Implementation figures
Implementation-figures can only be presented on the respective national levels. It is interesting to note that the fact that certain implementation figures are perceived as a success or not depends on the local context and culture and is not generalizable. For example, Austrian figures of solar thermal installations have been on decline for 4 years now, but in absolute terms are still perceived being high.

7. Challenges / factors of success?
There is one significant competitor for both, small scale biomass (pellets-) and solar thermal technologies: heat-pumps, potentially combined with photovoltaic systems. This challenge is perceived in Latvia and Austria. This system is easy to install, usually cheaper than the competitors, and PV has a very positive image. Currently, PV takes over the very place of the favorite renewable energy source. In Bulgaria, one significant competitor is the relatively low price for electricity, regulated by the state, which makes it economically sensible to heat directly with electricity.

One challenge throughout most of the countries is to improve the professional capacity of installers and other related professionals. In Spain, one problem is that new investment in renewable system account as debt for public entities. Information for rural communities and for responsible persons for urban planning is still poor; the result is lack of trust in some countries (Spain).
# Findings Austria

The Austrian team selected the following stakeholders to be interviewed:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Contact Person</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ministry of Agriculture, Forestry, Environment and Water Management</td>
<td>Mr. Gottfried Lamers</td>
</tr>
<tr>
<td>2</td>
<td>Ministry of Agriculture, Forestry, Environment and Water Management</td>
<td>Mr. Wolfgang Jank</td>
</tr>
<tr>
<td>3</td>
<td>Federal Government of Salzburg</td>
<td>Mr. Gerhard Löffler</td>
</tr>
<tr>
<td>4</td>
<td>Federal Government of Salzburg</td>
<td>Mr. Helmut Strasser</td>
</tr>
<tr>
<td>5</td>
<td>Propellents Austria</td>
<td>Mr. Christian Rakos</td>
</tr>
<tr>
<td>6</td>
<td>Austria Solar</td>
<td>Ms. Doris Hammermüller</td>
</tr>
<tr>
<td>7</td>
<td>Federal Ministry of Science, Research and Economy.</td>
<td>Ms. Heidelinde Adensam</td>
</tr>
<tr>
<td>8</td>
<td>Klimaaktiv Programme</td>
<td>Mr. Stephan Fickl</td>
</tr>
<tr>
<td>9</td>
<td>Austrian Climate Fund</td>
<td>Mrs. Elvira Lutter</td>
</tr>
<tr>
<td>10</td>
<td>Federal Ministry for Transport, Innovation and Technology</td>
<td>Mr. Michael Paula</td>
</tr>
</tbody>
</table>

The findings of the interviews are summarized following the structure of the questionnaire:

**1. Policy framework**

The constitution and the political situation in Austria are characterized by a pronounced federal structure. The nine federal states of the country, which together constitute the republic, have a lot of possibilities to shape the policy framework for heat technologies individually on their own. The most important instrument of forming energy-related policy is the support scheme of the residential building sector ("Wohnbauförderung"). This instrument supports the building of new houses, and the renovation of existing houses and buildings. The amount of support can be linked to certain energy-saving measures and to the use of renewable energy sources.
**Biomass**
Some Austrian federal states started to support individual biomass heating systems (then logwood-boilers and woodchip-boilers) very early in the 1990ies. Only later, in the early 2000, this system was extended to pellet heating systems.

**Solar thermal**
In the 1980ies, the enthusiasm of certain political actors in the federal states was essential to bring the then relatively new technology forward. They developed and financed support-systems, and competed against their colleagues in the other federal states.

In the consequence, the federal states started to compete against each other in terms of who had the most successful scheme for the support of renewables. This fruitful competition created a steady improvement of the individual federal systems and allowed to accelerate upward along a steep learning-curve, steadily improving technologies and related support-schemes. It was essential to find the best support-scheme experimentally. The enthusiasm of individual political actors in the federal states was crucial for the implementation of technologies.

**Energy Efficiency**
In Austria, the Federal Law on Energy Efficiency (Nr. 72/2014) has been published 2014. Within this Law, the Directive 2012/27/EU of the European Parliament and of the Council ... on energy efficiency (EED) is implemented. Regarding the project RES H/C SPREAD, especially article 14 EED – promotion of efficiency in heating and cooling - is of great importance. By 31 December 2015, Member States shall carry out and notify to the Commission a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling. In Austria, this assessment was carried out by the Technical University of Vienna (TU Wien) together with Ecofys, on behalf of the Federal Ministry of Science, Research and Economy.

**Structural funds**
The Climate and Energy Fund has been set up in 2007 with the overall aim to implement a sustainable and climate-friendly energy system. During the period from 2007 to 2014, the Fund supported over 76,000 projects with a total amount spent of 934 mio. €. The main fields of support are sustainable energy sources, research and development as well as for accelerating market penetration. Priorities are changing year by year, depending on market conditions, in order to bring dynamic into the market. In recent years, the following four fields of actions have become major pillars of the Fund’s support strategy: Creating networks, structural changes, innovation funding, mitigation of and adaptation to climate change.

Austria’s fund “Environmental Assistance in Austria” is a based on the Environmental Aid Act and environmental aid guidelines. In the field of energy supply, subsidies are focused on facilitating the substitution of fossil resources with renewables, e.g. replacing fuel-based with renewable-energy-based heating systems. The amount of investment funding depends on the technology and the size of the facility. Usually, a flat rate of de minimis support is calculated. “De minimis” allows for aid up to € 200,000 over a period of three years. Another option for support is the ‘standard reimbursement rate’ which mostly amounts to 25% of the environment-related investment costs which can be increased to a maximum of 35%.

RES HC is also topic in the 2014-2020 Rural Development Programme. Support can be provided to investments in new biomass heat and CHP plants and heat grids, renovation of existing plants, measures to improve the efficiency of heat grids and facilities for the production for biomethane and biogas. The regular funding rate is 25% of the eligible investment costs. Under certain conditions it can be up to 35%.
2. Implementing Agencies (Change agent)

Biomass
The main actors and supporters in the field of biomass are the Austrian Biomass Association (est.1995), the nine federal agricultural chambers as well as Propellents Austria.

Concerning the pellet-market, there was one initial step by a producer of formwork-panels, who convinced sawmills to start the production of pellets. The producers of boilers had been deeply waiting for this new fuel to be able to enter the market for small power-demands (single houses, flats), a market, which before that was fully covered by oil- and gas-systems - woodchip-boilers were too big, logwood-boilers were too un-comfortable. Heat-issues, generally, are within the competence of the federal states. So many actors in the federal states started to provide support for small scale heating systems, for small and big biomass district heating systems, at the regional and local levels, often themselves supported by the federal agricultural chambers, who realized the possibility to keep income among farmers and in rural areas by fostering the bioenergy-markets.

Solar thermal
The main actor related to this technology in Austria is the Institute for Sustainable Technologies (AEE INTEC; www.aee.at). It was founded in 1988 as an independent research association and is currently one of the leading institutes for applied research in the fields of solar thermal energy, low-energy- and zero energy buildings as well as in energy efficiency in industry.

3. Technology

Biomass
Big scale biomass use has a very long tradition in Austria, dating back to the early 1960ies when the first boilers were produced for sawmills to combust bark and use the produced heat for drying of boards. Small scale biomass was used in simple stoves and in tiled stoves for centuries. In the beginning of the 1990ies, a competition, initiated by the Federal Ministry of Technology, to produce an automatic small woodchip boiler, was the very starting-signal for technology-development of small scale biomass boilers in Austria. Although the result was not satisfactory, companies learned a lot out of this competition, and continued the development of combustion technologies and small scale boilers since then. This technological development was further supported in the following years.

Concerning software-aspects, training-courses for plumbers were essential to bring the boilers to the market, as soon as they had been developed. Training-courses were carried out both, by the boiler-producers themselves, and by the Austrian Biomass Association. Soft skills of planners and advisers, standards for planning and performance, and quality-assurance-systems were decisive elements to establish the necessary trust in the technologies, and to guarantee the quality. One example is the Quality-management-system for heating-plants (“QM-Heizwerke”)

Solar thermal
The development of solar thermal collectors started in a group of anti-nuclear activists as a response to the oil-crisis. In the beginning (1980ies), the collectors were built by members of the group, mainly farmers, themselves, the plans for construction were open source and were spread from village to village, together with some tools which allowed the construction of the collectors. Only in the 1990ies, industrially built collectors entered the market, control-systems were introduced and steadily improved, heat-storage boilers were constructed, optimized and integrated into the system.
In the beginning, installers were trained together with the self-building movement. Although a special training-course for installers is existing (“solarteur”), solar thermal trainings are still not part of the ordinary trainings of installers.

**Fuel (Biomass):**
Wood as a fuel generally has a positive image in Austria: it originates in the vicinity of the place where it is being used, its combustion generates regional income, and it supports the energy-independence of the country.

4. **Incentives, cost aspects**
Incentives to support implementation of new technologies usually follow the path of
- support for research to develop the technologies and reduce the costs
- support for demonstration-plants to proof technology and
- support of deployment of technology in the markets (mass-subsidies for consumers).
All three models have been in place in Austria.

For individual households, the support scheme of the residential building sector was the most important supportive instrument to establish biomass heat-systems.
For companies, another supportive system is in place, called the national environmental support system (“UFI”). This system has been in place since the 1980ies, initially designed to support investments in environmental technologies for water- and air-cleaning, for paper-mills, for desulphurization, de-NOx, dust-removal etc. the system was steadily adopted and currently has a focus on CO$_2$-saving measures.
Very important for the implementation of biomass-technologies, both small scale and district-heating, was a special subsidy-scheme for agriculture and forestry, financed by the Ministry of Agriculture; only farmers were eligible for it, but they comprised the bulk of technology-investors and -users.
Another support-scheme is provided by the climate-fund, mainly targeted at photovoltaic, change of boilers, and big solar thermal plants.

However, according to majority of the stakeholders, the main outcome of the support-system is not primarily to enable the financial feasibility of environmental measures (only for big investments like biomass district heating plants the amount may have been decisive), but to establish trust, motivation, and confidence for certain technologies among companies in industry. Out of companies in the area of pellet-producers, sawmills and related branches, roughly only 1/3 of eligible companies apply for financial support when they invest in energy- and environmental technologies.
The same phenomenon was reported with respect to private consumers investing in solar thermal systems, in pellet-systems and similar technologies: the amount of financial support is **not decisive** for an investment. The principal availability of a support-scheme increases the necessary trust in the technology, which positively supports the investment-decision. “Support” by public authorities generally is a good word. It would create both, trust in a technology, and improved financial feasibility.
Technological progress and industrial production of solar-thermal collectors did not result in a significant cost-reduction of the systems. The reasons are not really obvious; some experts conjecture that the installers did increase their share of the costs.

5. **Information exchange**
Information concerning renewable energy in Austria has historically been supported by two specific events, which concentrated attention at the topic energy and raised the question, how the country could reach energy-independency and raise its self-sufficiency: the referendum of 1978, which stopped, and banned the use of nuclear energy originating in nuclear fission, and the public resistance against a big hydropower-plant in the floodplain-forests along the Danube.
east of Vienna, in 1984/85. After these two historic events, it was much easier in Austria to argue for energy-alternatives, and energy per se was a topic publicly discussed. Information-work is also been carried out in the communities, among neighbors and in villages. The implementation of a technology supports social cohesion of a community, friends and neighbors act as positive examples.

One very supportive event for renewable heating technologies is the annual trade-fair for energy-saving technologies in Wels, Upper Austria, usually carried out every first weekend of March.

Also the Climate- and Energy Pilot Regions in Austria (see Annex Best Practice for details) is another method to bring information about new technologies to potential investors and consumers in the different regions.

One general finding was reported by most of the stakeholders interviewed: information-work was more important for the implementation of technologies, especially those for small scale applications, than the height of incentives. Incentives supported the implementation by creating trust in certain technologies.

6. Implementation figures

In the following, implementation-figures for Austria are presented (figures 3 – 7). It is worth noting the dramatic development, characterized by a steep rise, of photovoltaic systems and heat-pumps, while at the same time the number of newly installed solar thermal systems is declining since 2009, and the number of pellet- and logwood systems is retreating too.

![Figure 3: Market development of different biomass fuel types from 2007 to 2013 in Austria. Despite the impressive relative growth-figures of wood-pellets, log-wood and wood-chips remain the most important biomass-fuels in absolute terms. Source: BMVIT, 2014](image-url)
In Austria, the total solar thermal capacity installed accounted for 3449.4 MWth at the end of 2012; 146.2 MWth were installed within the year 2012. All in all, solar thermal collectors have shown an impressive growth over the last three decades.
7. Challenges / factors of success

There is a significant competitor for both, small scale biomass (pellets-) and solar thermal technologies: heat-pumps, potentially combined with photovoltaic systems. This system is easy to install, usually cheaper than the competitors, and PV has a very positive image. Possibly, pellet-boilers will be available only in the power-range above 50 kW within a decade, because the market for small scale applications tends to shrink. Between 2000 and 2006, pellet-boilers were a fashionable product. Currently, PV takes over the place of the favorite renewable energy source. Many investors and consumers, who are principally willing to invest
their money in renewables, now direct their investment towards PV, away from alternatives like solar-thermal or biomass.

Another challenge for both technologies remains the poor education-status of plumbers (installers): some 90% of plumbers still lack qualified expertise for the installation of biomass-boilers (Rakos, 2014). Despite all efforts in the past, trainings have been insufficient. New learning-courses (E-learning) would be required, including architects, and planners as target-groups.

Many installers lack interest for solar thermal systems because they install too little systems to really achieve professional expertise, and because their relative income from the installation of ordinary systems (gas-, oil-boilers, showers, water-pipes etc.) is much higher. Concerning solar thermal systems, the quality of the installations and the respective costs for it are still problems and a challenge. Nevertheless, energy-independence will possibly be a motivator for the future development of solar thermal systems.

The lack of spatial energy-planning in Austria has been identified as a hurdle against sensible implementation of renewable heat technologies (district heating, for example)

Generally, the availability of financial support will possibly decrease in the future. New systems will be established, the final outcome, however is not clear yet. One scheme might be revolving funds, which produce liquidity (important according to Basel III-scheme).

**Good-practice examples**

On the basis of the analysis performed in WP2 as well as referring to the results of the questionnaire, the following good-practice examples were selected in Austria (see annex for details):

- Climate and Energy Pilot Regions in Austria – Pilot Region Manager – Driving Force in the Region
- District Heating in Stettldorf, Lower Austria
- Klimaaktiv – Network for Change / Modern governance for climate protection
- Domestic Environmental Support
- e5 – National Energy and Climate Protection / Program for Municipalities
- Goess brewery goes green

**Literature**


http://www.nachhaltigwirtschaften.at/e2050/e2050_pdf/201426_marktentwicklung_2013.pdf
Findings Bulgaria

The team from Bulgaria interviewed 5 national experts from the Ministry of Economy and Energy, the National Association of Municipalities in the Republic of Bulgaria (NAMRB), the Sustainable Energy Development Agency (SEDA), the Bulgarian District Heating Association (BDHA), and Smolyan Municipality. It has been stated that the information will be treated confidentially. For that reason, personal names and cannot be provided in this section.

1 Policy framework

Despite Bulgaria has demonstrated impressive growth in the use of RES technologies in the recent years, there is still a lack of legislation in the RES heating and cooling sector. RES Projects mainly received financial support by means of the first EBRD (European Bank for Reconstruction and Development) credit line for business (Bulgarian Energy Efficiency and Renewable Energy Credit line BEERECL) and domestic consumers (REECL), EERSF, and the EU Structural and Cohesion Funds.

Although there is a certain lack of legislation, efforts have been made to promote RES technologies in recent years. One of the measures to support renewables is the Energy from Renewable Sources Act (ERSA), especially the establishment of feed-in premiums for RES-E. Depending on the type of technology, fuels etc., different levels of support are offered (highest for CHP). Furthermore, municipalities are obliged to develop and submit for approval programs promoting the use of energy from RES and biofuels in line with the NREAP. For example, measures for RES-use in municipal buildings, support schemes for district heating networks etc. shall be included.

In addition, tax exemptions are in place for buildings with a high class of Energy Performance Certificate (EPC). This incentive became effective as of 1st January 2005 and its conditions have been adjusted several times since then.

The comprehensive assessment of CHP and DHC potential in Bulgaria, according to Art.14 of the Directive 2012/27/EU (EED) was delayed. It was finalized on 8th October 2016 and published at: (https://www.me.government.bg/files/useruploads/files registri/report_art_14_eed_bulgaria_20161008.pdf). The document provides an assessment of the current and future heating and cooling demand (tables and maps), an estimation of the national CHP potential and cost-benefit analyses of the utilization of this potential, assessment of the energy efficiency potential for DHC, policies measures, and assessment of the primary energy savings that would result from these measures.

The Energy Efficiency and Renewable Sources Fund in Bulgaria (EERSF) has been established to provide financial and technical assistance for public and private sector energy efficiency (EE) projects. The Fund is a legal entity and manages the financial means allocated for energy efficiency investment projects in compliance with the National Energy Strategy. Regarding RES, the focus is on small projects and measures.

2 Implementing agencies (Change agent)

In Bulgaria different change agents are in place, mostly organized at public level. Notable implementing agencies are the Ministry of Economy and Energy and the State Energy and Water Regulatory Commission http://dker.bg, active at the national level. The main
technologies addressed are biomass CHP. Another important change agent is the National Revenue Agency, (www.nap.bg), which offers tax exemptions for buildings utilizing renewables.

At both national and local levels, the Sustainable Energy Development Agency was identified as an important change agent who addresses all RES technologies (www.seeea.government.bg). Among the others, it addresses soft measures like information, advice, networking, training and it supports the assessment of RES potential. Furthermore, the Energy Efficiency and Renewable Sources Fund (www.bgeef.com) is worth to mention. It is a public-private-partnership providing a number of attractive financial products for numerous RES (i.e. RES H/C) applications.

The National Biomass Energy association (www.euba.bg) is the most notable private association, especially concerning small- and big-scale biomass heating systems. It offers software measures like information exchange, trainings, maintenance services etc.

3 Technology
Different good practice examples for technology implementation have been selected in Bulgaria. An important technology is biomass CHP with grid connection, which is successfully implemented and also supported by feed-in premiums. Bulgaria has a certain tradition using biomass for heating purposes, mainly logwood, woodchips, pellets.

4 Incentives, cost aspects
As mentioned above, financial support has been offered by the European Bank for Reconstruction and Development as well as by the EU Structural and Cohesion Funds. On a national level, important feed-in premiums for RES-E and property tax exemptions for buildings using renewable energy are in place:

The duration of the property tax exemption period is prolonged by two or three years, if renewable energy is utilized. The amount of property tax is set individually in each municipality and depends mainly on the construction type and particular location. These tax exemptions have shown to be an important measure to push the use of renewables in Bulgaria.

In the case of biomass CHP, the producer sells the generated electricity to the respective grid operator at a price having two components: 80% of the electricity retail price for the previous calendar year and a feed-in premium that depends on the technology, capacity and fuel.

5 Information exchange
As in other member states, the interviews have shown that information exchange is a key-success factor for RES H/C in Bulgaria. In the course of Municipal Renewable Energy Programs, large scale awareness-raising of high level decision makers at municipalities (e.g. mayors) and training of persons directly responsible for the development and implementation of the plans are necessary. The relevant implementing agency in this case is the Sustainable Energy Development Agency.

The implementing agencies use websites and special events to disseminate their contents to a wider audience. The National Biomass Energy Association also offers special trainings and audits.

6 Implementation figures
In Bulgaria, the primary energy production of solid biomass accounted for 0.974 Mtoe in 2012, while the consumption was 1.275 Mtoe. Considering these statistical data, Bulgaria’s energy
production of solid biomass is slightly below the EU average, if we consider the share in the final energy consumption of the respective country. The actual biomass energy production, however, is higher, because the official statistical information does not include the illegal cuts.

The solar thermal capacity installed at the end of 2012 accounted for 58.1 MWth (5.6 MWth within the year 2012).

**Good-practice examples**
On the basis of the analysis performed in WP2 as well as referring to the results of the questionnaire, the following good-practice examples were selected in Bulgaria (see annex for details):

- Feed-in premium for electricity from biomass – A driver for biomass-fuelled CHP
- Property tax exemption for buildings using renewable energy
- Local actions towards renewables: Municipal renewable energy programs
- Energy Efficiency and Renewable Sources Fund (Bulgaria)
- Business model for biomass heating: a complete solution for public buildings

**Literature**


Findings Greece

The Greek team selected the following stakeholders to be interviewed:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Contact Person</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ministry of Environment, Energy and Climate Change</td>
<td>Ms. Papadogianni Aikaterini</td>
</tr>
<tr>
<td>2</td>
<td>Ministry of Environment, Energy and Climate Change</td>
<td>Mr. Tsalemis Dimitrios</td>
</tr>
<tr>
<td>3</td>
<td>Ministry of Environment, Energy and Climate Change</td>
<td>Mr. Alexopoulos Dimitrios</td>
</tr>
<tr>
<td>4</td>
<td>Ministry of Environment, Energy and Climate Change</td>
<td>Mr. Athanasiou Dimitrios</td>
</tr>
<tr>
<td>5</td>
<td>Regional Authority of Western Macedonia</td>
<td>Mr. Dimitris Mavromatidis</td>
</tr>
<tr>
<td>6</td>
<td>Municipality of Kozani</td>
<td>Mrs. Theodora Topali</td>
</tr>
<tr>
<td>7</td>
<td>Municipality of Ptolemaida</td>
<td>Mr. Kostas Nikou</td>
</tr>
<tr>
<td>8</td>
<td>Municipality of Kastoria</td>
<td>Mr. Kosmas Toubidis</td>
</tr>
<tr>
<td>9</td>
<td>Municipality of Grevena</td>
<td>Mr. Ioannis Matentzidis</td>
</tr>
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</table>

1. Policy framework

The Greek programs that are worth mentioning in the framework of the RES H/C project are of two types:
- Three programs implemented at national level:
  - Program “Energy Efficiency at Household Buildings”
o “Exoikonomo” - Integrated energy planning of municipalities;
  o “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings”
  o and “Improvement of energy efficiency in Schools” target to the financial support of energy efficiency interventions and to the promotion of renewable energy sources.

- One program implemented at municipal level concerning the energy planning of Kozani Municipality. This is a voluntary action developed in the framework of the Covenant of Mayors action aiming at improving the energy planning effectiveness at municipal level and to contribute to improve the local penetration of renewable energies.

The program “Energy Efficiency at Household Buildings” has been launched in 2011 and financed by the Regional Programs and the Operational Program of Competitiveness and Entrepreneurship as well as the Operational Program of Environment and Sustainable Development under the National Strategic Reference Framework (NSRF) 2007-2013. Until March 2014 about 70,000 applications have been submitted for participation in the program, 40,000 have already been accepted.

Two years earlier, the program “Exoikonomo” has been initiated. It has been co-financed by the NSRF 2007-2013 as well as through the Operational Program of Competitiveness and Entrepreneurship. In addition, each participating municipality has also been involved. The Center for Renewable Energy Saving (CRES) is responsible for the technical coordination of the program providing the necessary consultancy to each municipality during the implementation of the planned energy efficiency measures. Totally, 104 municipalities participated in the program.

The NSRF 2007-2013 also financed the program “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings”, which was launched in 2010. All the buildings of the public sector were eligible for participation into the program with the exemption of the buildings, which belong to the municipalities. Each municipality was responsible for the planning and implementation of the proposed interventions.

In 2011, the program “Improvement of energy efficiency in Schools” has been initiated and financed by NSRF 2007-2013. The Local Authorities (mainly Municipalities), the Ministry of Education and the National School Buildings Organization S.A. are the official operators responsible for the planning and implementation of the proposed interventions and actions, under the supervision of the Ministry of Environment, Energy and Climate Change.

It should be highlighted that the contribution of the structural funds through the NSRF 2007-2013 is crucial for the implementation of energy efficiency and RES projects in Greece. Specifically, the majority of the energy efficiency and RES measures have been financed with the utilization of structural funds through the Operational Program of Environment and Sustainable Development and the Operational Program of Competitiveness and Entrepreneurship, as reported to the submitted 3rd National Energy Efficiency Action Plan, including the abovementioned measures for the further penetration of RES and energy efficiency technologies for heating and cooling.

Finally, the implementation of Art.14 of the Directive 2012/27/EU (EED) in Greece has started with the adoption of the L.4342/2015, which transposed the EED into the national legislation. Moreover, the Comprehensive Assessment was prepared and notified to the EC in March 2016.
2. Implementing Agency (Change agent)

The main change agent in Greece is the Ministry of Environment, Energy and Climate Change. It initiated all of the programs at a national level described in the previous section. In the case of the program “Exoikonomo”, also the municipalities are involved.

In addition, the Covenant of Mayors Office, established and funded by the European Commission, is an important change agent. It is, inter alia, responsible for the coordination and daily management of initiatives. Furthermore, administrative support and technical guidance is offered. Moreover, if facilitates networking between between Covenant stakeholders and ensures the promotion of their activities. The Covenant of Mayors Office is managed by a consortium of European networks representing local and regional authorities, led by Energy Cities and composed of Climate Alliance, CEMR, Eurocities and Fedarene. Each municipality is responsible for the planning and implementation of the proposed interventions as it is planned into their SEAP.

3. Technology

The “Energy Efficiency at Household Buildings” program provides financial support to the upgrading of the heating and hot water supply systems. Among the eligible interventions is the installation of a new, or replacement of the existing, burner and/or boiler system with a new (central or independent) diesel or gas system, or a system mainly using a renewable energy source (RES) (e.g. biomass burner, heat pumps, solar-thermal systems, etc.), or a system for the high-efficiency cogeneration of electricity power and heat (HECHP). Moreover, the installation of solar systems for hot water supply (solar collector, water tank, mount, pipes, etc.) is foreseen.

The “Exoikonomo” program supported interventions in existing municipal buildings, in public areas of the urban environment, in urban transport and in other urban (municipal) infrastructure leading to the penetration of renewable energy sources.

The “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings” program financed the replacement of old boilers systems with new, which can utilize as potential fuels RES, or natural gas, or LPG, the replacement of old systems with new high performance central air conditioning systems, the installation of solar thermal hot water production systems, the penetration of geothermal systems, the installation of systems for the production of renewable heating and cooling energy and heat pumps as well as the penetration of passive solar systems.

Within the “Improvement of energy efficiency in Schools” program, the implementation of interventions on the building envelope and on the electrical/mechanical heating/cooling systems (such as PV, geothermal energy systems, biomass combustion systems, solar systems and heat pumps), the penetration of natural/artificial lighting systems as well as the installation of energy management systems (BEMS) has been foreseen.

The Municipality of Kozani has implemented energy and environmental applications such as district heating (local coal-fired power plant), waste management and recycling. There are also a significant energy saving interventions and bioclimatic applications in buildings.

Regarding the utilized technologies the “Energy Efficiency at Household Buildings” program promotes biomass, heat pumps and solar energy, the “Exoikonomo” program passive solar, heat pumps and biofuels, the “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings” program biomass, heat pumps, solar, geothermal and passive solar, the “Improvement of energy efficiency in Schools” program PV, geothermal, biomass,
solar and heat pumps and the “Covenant of Mayors Sustainable regarding the energy planning of Kozani Municipality” PV, solar, geothermal, heat pumps, biomass, biofuels and bio-CHP.

4. Incentives, cost aspects
Within the program "Energy Efficiency at Household Buildings", different incentives per category of citizens are provided. The eligible budget per single application may not exceed 15,000 € including VAT. The total budget of the program is of 548.2 million €, being the cost of energy audits and the expenditures for the project consultancy covered by the program.

The total budget of the “Exoikonomo” program was of 100 million euros. Initially this budget was intended to be co-financed 70% by the NSRF 2007-2013 and 30% by each municipality being budget thresholds for each local authority proportional to the municipality population. Actually the Ministry decided to finance the 100% of the program for the NSRF 2007-2013.

The total budgets of the programs “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings” and “Improvement of energy efficiency in Schools” was 40 million being the interventions 100% financed by the NSRF 2007-2013.

The program “Energy Efficiency at Household Buildings” supports the implementation of interventions in private buildings, the “Exoikonomo” program in municipalities, the “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings” program in public buildings and the “Improvement of energy efficiency in Schools” program in public primary and secondary education schools. Finally, the measures of the Kozany municipality energy plan are addressed to municipal buildings, public lighting, residential, tertiary sector, agricultural and transport sector.

5. Information exchange
The main information exchange is provided through the corresponding websites. In addition, the four programs foresee the conduction of specific dissemination, networking and information actions.

6. Implementation figures
Until March 2014 about 70 thousand applications were submitted for participation in the program “Energy Efficiency at Household Buildings”. 104 municipalities participated in the "Exoikonomo" program, while in the program "Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings” 63 applications were submitted during the evaluation phase and 13 of them were financed finally. Until March 2014, 73 schools have been selected for participation into program “Improvement of energy efficiency in Schools”.

In Greece, the total production of primary energy of solid biomass accounted for 1 Mtoe in 2012 (consumption: 1.136 Mtoe).

The solar thermal capacity installed accounted for 2884.7 MWth at the end of 2012; 170.1 MWth were installed within the year 2012.

7. Challenges / factors of success
The program “Energy Efficiency at Household Buildings” was evaluated as very successful despite the limited participation of the citizens. This problem solved with the establishment of the first category of incentives with the highest percentage of grant (70%). As a result it was announced the continuation of the program during the programming period of 2014-2020.
The mobilization of the municipalities is crucial for the implementation of actions in public buildings and to this direction contributed the program "Exoikonomo". Moreover, the decision to increase the funding of the program from 70% to 100% throughout the NSRF 2007-2013 has led to the implementation of several actions energy efficiency measures.

The “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings” and “Improvement of energy efficiency in Schools” programs led to the implementation of measures for the fulfillment of RES and energy saving targets strengthening the exemplary role of public sector.

Finally, the energy planning activity of the Kozani municipality is expected to facilitate the efficient use of financial tools as well as the integration of the proposed measures in order to implement targeted environmental and energy policy projects of the municipality.

**Good-practice examples**

On the basis of the analysis performed in WP2 as well as referring to the results of the questionnaire, the following good-practice examples were selected in Greece (see annex for details)

- Program “Energy Efficiency at Household Buildings”
- Program “Exoikonomo” Integrated energy planning of municipalities
- Program “Renewable Energy Sources and Energy Saving Demonstration Projects in Public Buildings”
- Covenant of Mayors Sustainable Energy planning of Kozani Municipality
- “Improvement of energy efficiency in schools” Program

**Literature**


Findings Italy

The Italian team selected the following stakeholders to be interviewed:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Contact person</th>
<th>Position</th>
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</thead>
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<tr>
<td>Ministry of Environment</td>
<td>Sebastiano Serra</td>
<td>Former head of Technical Secretariat</td>
</tr>
<tr>
<td>Emilia-Romagna Region</td>
<td>Attilio Raimondi</td>
<td>Senior Policy Officer Energy Department</td>
</tr>
<tr>
<td>Lombardia Region</td>
<td>Mauro Fabrizio Fasano, Anna Fraccaroli</td>
<td>Supervisor of Energy Department</td>
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<tr>
<td>Piemonte Region</td>
<td>Stefania Crotta, Mauro Bertolino</td>
<td>Supervisor of Energy Department</td>
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<td>Anci Emilia-Romagna</td>
<td>Alessandro Rossi</td>
<td>Supervisor of Energy Department</td>
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<tr>
<td>Ambiente Italia</td>
<td>Riccardo Battisti</td>
<td>Supervisor of Renewable Energies</td>
</tr>
<tr>
<td>ARE Energy Agency Liguria Region</td>
<td>Maria Fabianelli</td>
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</tr>
<tr>
<td>GSE SpA - Division Studies, Statistics and Special Services</td>
<td>Costantino Lato</td>
<td>Director</td>
</tr>
<tr>
<td>IKEA</td>
<td>Riccardo Giordano</td>
<td>Environmental Manager Italy</td>
</tr>
<tr>
<td>Ferrari SpA</td>
<td>Mattia Murgia</td>
<td>Digital Senior Project Manager</td>
</tr>
<tr>
<td>Municipality of Monchio delle Corti (Parma)</td>
<td>Sara Sandei</td>
<td>Technical Area Manager</td>
</tr>
<tr>
<td>Engineering Consultancy</td>
<td>Andrea Gualdi</td>
<td>Engineer</td>
</tr>
</tbody>
</table>

1. Policy framework
In Italy there are various different mechanisms in place promoting renewable energy sources for heating and cooling. Interesting schemes and decrees are the following:

Legislative Decree n.102/2014
Transposition of the Directive 2012/27/EU on energy efficiency (amending Directive 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC). The Decree entered into force on 19 July 2014 and introduced into national legislation innovative measures aimed at promoting energy efficiency in public administration, businesses and families in accordance with the objectives set by the European Union of a reduction in the consumption of primary energy by 20% by 2020. The framework will contribute to achieve a reduction of 20 Mtoe of primary energy consumption (i.e. 15.5 Mtoe of final energy) in line with the National Energy Strategy, with a funding allocation of almost 800 million euros from 2014 to 2020. The full text can be found at http://www.gazzettaufficiale.it/eli/id/2014/07/18/14G00113/sg

Conto termico scheme

At national level in Italy the main active policy supporting small-scale projects of energy efficiency improvement and production of thermal energy from renewables is the Ministerial Decree of 28 Dec.2012 (the so-called “Renewable Energy for Heating & Cooling Support Scheme” or “Conto Termico” in Italian, which implemented Legislative Decree no. 28 of 3 Mar. 2011). More details and the full text of the Decree can be found at http://www.gse.it/it/Conto%20Termico/GSE_Documenti/_DM_28_DICEMBRE_2012_CONTO_TERMICO.PDF

Two categories of projects are eligible for incentives:

- energy efficiency improvement projects;
- small-scale projects concerning systems for production of thermal energy from renewables and high-efficiency systems:
  - replacement of existing systems for winter heating with more efficient ones (condensing boilers);
  - replacement and, in some cases, construction of new renewable-energy systems (heat pumps, biomass boilers, heaters and fireplaces, solar thermal systems, including those based on the solar cooling technology).

The new decree also introduces - subject to specific requirements - incentives for energy auditing and energy certification associated with the above projects.

National tax credit scheme for energy efficiency

Deductions are granted for interventions that increase the energy efficiency of existing buildings. Interventions for efficient heating and cooling include: condensing boilers, biomass boilers, solar thermal panels and heat pumps. National Law 27 December 2013 n°147 (so called “Stability Law” 2014) defines deduction of 65% for costs incurred from 6 June 2013 to 31 December 2014. The deduction will decrease to 50% for payments made from 1 January 2015 to 31 December 2015. Expenditures incurred before June 6, 2013 benefited from a deduction of 55%. From 1 January 2016, the benefit will be 36% (ordinary deduction available for building renovations).

2. Implementing Agency (Change agent)

The Italian Government is the main change agent for the two main schemes available, with their implementation processes carried out through two different agencies:
Gestore dei Servizi Energetici-GSE S.p.A. is the body in charge of implementing and managing the "Conto Termico" scheme, as well as of awarding financial incentives;

ENEA (National Agency for New Technologies, Energy and Sustainable Economic Development) is managing the national tax credit scheme.

Development Programmes at regional level (such Rural or Operative Programmes) which could support and grant incentives to HC technologies are managed by the relevant Regional Governments.

3. Technology
The technologies identified in the survey are:

- small scale biomass heating (pellet stove)
- liquid biomass (vegetable oil)
- district heating based on biomass (forest biomass), municipal solid waste and geothermal energy
- geothermal heating (shallow and deep), potentially in all sectors
- heat pumps using ambient heat

The role of biogas for heating and cooling as well as solar thermal energy use is also of interest in Italy, but has to be investigated more in detail.

4. Incentives, cost aspects

Conto termico scheme

Basically, the scheme allocates funds for a maximum yearly cumulative disbursement of € 200 million for projects implemented or to be implemented by public administrations and a yearly cumulative disbursement of € 700 million for projects implemented by private parties. The support is granted on the basis of the type of project and on the improvement of the energy performance of the building which may be achieved and/or on the energy which may be produced by renewable energy systems. The incentive (contribution to the costs incurred for the project) will be paid in yearly installments over a variable support period (2 to 5 years), depending on the projects.

National tax credit scheme for energy efficiency

Beneficiaries are individuals, professionals, companies and firms that have expenditures for interventions on existing buildings (or parts of them) of any cadastral category, including rural buildings. The tax credit (until end of 2014 equal to 65% of the expenses paid for the intervention, 50% from 1 January 2015 to 31 December 2015) is divided into ten equal yearly amounts.

5. Information exchange
The information exchange by the change agents identified is mainly done through general and specific information available online.

6. Implementation figures
The details of the success case study identified are described in the relevant factsheets.
Generally, Biomass use accounted for 4.060 Mtoe of primary energy production of solid biomass in 2012, which is among the highest values in Europe. However, the per-capita consumption is very low (0.087 toe/capita). By 2012, Italy has installed 2380 MWth of solar thermal energy collectors.

7. Challenges / factors of success
As told before, the main incentives available at national level for the development of energy efficiency and heating and cooling technologies are the Tax Credit and the Conto Termico schemes.

The effects of the Tax Credit Scheme have been evaluated from 2007 (first implementation year) until 2012. The total energy savings reported accounted for more than 9,000 GWh/year, with an environmental benefit in terms of avoided CO₂ emission into the atmosphere estimated of more than 1,900 kt/year. The scheme, in these respects, is successful. Nevertheless the number of request for tax credit is decreasing from the maximum reached in 2010, with a national distribution concentrated in only four regions in the north of Italy (which account for the 60% of interventions), with the south of Italy still lagging behind. In addition to this, the tax credit will decrease to 50% in 2015 (it was 55% and 65% before), with no assurance (at the moment) that it will be extended in the future.

While the Tax Credit scheme is not available for public bodies, the Conto Termico scheme fills this gap. The Conto Termico is still in operation and an evaluation of its effectiveness is difficult. Anyway the promotion of this opportunity for private and public bodies needs to be enhanced, since at the moment only a few parts of the available incentives (€ 900 million euros) have been requested by the potential beneficiaries. Some improvements may also be desirable in the process for claiming the incentives and in the response time from the managing authority.

Good-practice examples
On the basis of the analysis performed in WP2 as well as referring to the results of the questionnaire, the following good-practice examples were selected in Italy (see annex for details).

- Lombardia Region – Italy information system for installation of low-enthalpy geothermal heat pumps (supported by Regional Regulation 7/2010 of Lombardia Region)
- Monchio delle Corti, Parma Biomass power plant, district heating plant, ORC (Organic Rankine Cycle) turbine (supported by the Regional Rural Development Fund 2007-2013)
- Private Home – Active House 9 Bosco Street, Campogalliano (Modena) (good practice example for energy efficiency tax credit as defined in the Italian National Law 27 December 2013/147)
- Casaglia, Terrara District heating plant based on geothermal energy and waste to heat (benefitted from an old law (n. 382 of 1982) which was replaced by law 10/1991)
- Ikea – Rimini. Installation of geothermal heat pump, photovoltaic system and a trigeneration plant in tertiary sector (the measures were presumably taken by the private operator without the use of incentives)
Literature


Findings Latvia

The Latvian team interviewed the following key-stakeholders:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Contact Person</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Development Council of Riga Planning Region</td>
<td>Mr. Dagnis Strauberg</td>
<td>Chairman</td>
</tr>
<tr>
<td>2 Riga Planning Region</td>
<td>Mr. Janis Miezeris</td>
<td>Head of Administration</td>
</tr>
<tr>
<td>3 Ministry of Environmental Protection and Regional Development</td>
<td>Ms. Ilze Prüse</td>
<td>Head of Climate and Environment Policy Integration Department</td>
</tr>
<tr>
<td>4 Ministry of Economy</td>
<td>Ms. Karlis Pīgens</td>
<td>Department of Energetics, Head of Renewable Energy Sources and Energy Efficiency Division</td>
</tr>
<tr>
<td>5 Riga Municipal Agency (Riga Energy Agency”)</td>
<td>Ms. Maija Rubina</td>
<td>Director</td>
</tr>
<tr>
<td>6 Salaspils County Municipal</td>
<td>Mr. Andrejs Jaunkalns</td>
<td>Executive Director</td>
</tr>
<tr>
<td>7 Ogre County Municipal</td>
<td>Peteris Spakovskis</td>
<td>Executive Director</td>
</tr>
<tr>
<td>8 Jurmala City Municipality</td>
<td>Ms. Gunta Smalka</td>
<td>Executive Director</td>
</tr>
<tr>
<td>9 Riga City Municipality</td>
<td>Mr. Juris Radezevics</td>
<td>Executive Director</td>
</tr>
<tr>
<td>10 Lielvarde County Municipality</td>
<td>Mr. Gvido Vitolins</td>
<td>Executive Director</td>
</tr>
<tr>
<td>11 Association of Latvia District Heating Companies</td>
<td>Mr. Ilmārs Rūsis</td>
<td>Chairman</td>
</tr>
<tr>
<td>12 Latvia Renewable Energy Source Federation</td>
<td>Mr. Andis Karklins</td>
<td>Chairman</td>
</tr>
<tr>
<td>13 Housing and Energy Conservation Bureau</td>
<td>Mr. Nicholas Stancioff</td>
<td>Chairman</td>
</tr>
</tbody>
</table>

In addition, interviews have been held with Andžela Pētersone (Ministry of Economics, Department of Renewable Energy and Energy Efficiency), Ina Bērziņa Veita (Salspils Municipality district heating company (DH) and Latvia district heating company association) and Edgars Vigants (Renewable energy federation (organization that combines different renewable energy association).
1. Policy framework

Latvia has got one of the highest individual targets for the share of renewable energy by 2020, namely 40% from the total final energy consumption. The share of renewable energy sources accounted for 35.8% in 2012. In the same year, 7.46 TWh of heat have been produced in 663 boiler houses as well as in 132 cogeneration plants. District heating is mainly located in the biggest cities of Latvia. An important long-term planning document that affects the use of renewable energy sources is the “Energy Strategy 2030”. However, there are no regional or local policies promoting RES in district heating. Besides the Energy Strategy 2030, the main legislation acts related to CHP are the Energy Law as well as the Electricity Market Law.

Moreover, important Cabinet Regulations are in place:

- Cabinet Regulation No.262 Adopted 16 March 2010 "Regulations Regarding the Production of Electricity Using Renewable Energy Resources and the Procedures for the Determination of the Price"
- Cabinet Regulation No.221 Adopted 10 March 2009 "Regulations Regarding Electricity Production and Price Determination Upon Production of Electricity in Cogeneration"
- Republic of Latvia National Renewable Energy Action

There have been several direct and indirect support schemes and grants provided to support RES use in district heating. The main support schemes are:

- Green investment scheme from the Ministry of Environment and Regional Development for transfer from fossil to RES
- State and European Union aid for rural and fisheries development (fuel production from agricultural and forestry products)
- Cohesion Fund (development of cogeneration power plants utilizing RES), managed by the Latvian Investment and Development Agency
- Indirect State aid Transmission system operators cover that part of the cost of connecting renewable energy generators’ systems incorporating the reconstruction costs of connecting the existing transmission and distribution system to generating plants at connection points chosen by renewable energy generators, as well as the costs of supplied and received electricity recording/measurement;
- Tax relief (the Law on Electricity Tax). There are tax exemptions in place for cogeneration power plants.

Regarding the implementation of the Energy Efficiency Directive (Directive 2012/27/EU of the European Parliament and of the Council ... on energy efficiency), the Ministry of Economics responsible for transposition of EED and Article 14 has prepared a concept where possible actions have been described and analyzed. At the moment a new energy efficiency law with will implement EED is under discussion. In the new energy efficiency law it is foreseen that comprehensive assessment of the potential for the application of CHP, DH and cooling will be done and assessment will be sublimated to the Commission before 31 December 2015. So far there is no publicly available report and study on implementation of Article 14. Representatives from Ministry of Economics are present in the project RES H/C’s Country Governance Committee meetings.
The Latvian Environmental Investment Fund (LVIF) has been established in 1997. From 2010 the Fund provides supervision of implementation and post-implementation monitoring of projects co-financed by Climate change financial instrument. The Climate Change Financial Instrument (CCFI) is a Government budget program of Republic of Latvia to prevent global climate change, adaptation to the effects of climate change and contribute the reduction of greenhouse gas emissions (for example, implementing activities to improve the energy performance of buildings in both public and private sectors, the development and implementation of technologies that use renewable energy resources, as well as the implementation of the integrated solutions to reduce greenhouse gas emissions). Detailed information can be found in: http://www.lvif.gov.lv/

2. Implementing Agency (Change agent)
In Latvia, different change agents are involved in the implementation process of RES H/C. The national policy and support provided to RES DH is administrated by the Ministry of Economics and the Ministry of Economics and Regional Development. Partly the Ministry of Agriculture is involved, too (mainly supporting the use of biogas in CHP).

Beside the Ministries, two ministerial Agencies, namely the Investment and Development Agency of Latvia (LIAA) and the Latvian Environmental Investment Fund, are important change agents. They provide, inter alia, grant schemes for RES H/C.

Furthermore, research institutes like the Institute of Energy Systems and Environment (Riga Technical University) are important implementing agencies in Latvia. As an example, it developed flue gas cooling and condensation equipment, which is now used in several wood chip boilers and contributes to efficiency improvements. Another important change agency in Latvia is Ekodoma.

Finally, private engineering and consultancy companies provide trainings and technical guidance for RES H/C projects. The Latvia District Heating Company Association is also a main stakeholder, although it is not directly involved in the developing or promoting of RES.

3. Technology
Currently, the main RES technology used in Latvia is district heating with biomass boilers (mainly wood chips). Some district heating companies buy or produce heat from biogas CHP plants. Pilot projects on the integration of heat pumps and solar thermal energy in district heating systems are already in place.

The most widely used RES technology for smaller consumers are either pellet boilers or logwood boilers. Furthermore, solar thermal collectors as well as heat pumps are used in households. The biggest challenge is the quality of installations as well as quality requirements on fuel. In order to improve the fuel quality, there have been projects and even an information campaign. Nevertheless, there is currently no national quality system in place. Despite of that, the quality of installations should be improved through a better education of the installers, especially in case of small pellet boilers, heat pumps and solar thermal collectors.

Other important issues in relation to biomass use are logistic centers for fuels. Such a logistic center links the supply and demand site and often improves the whole supply chain.
4. Incentives, cost aspects
In Latvia, several direct and indirect support schemes and grants to support the use of renewable energy sources in district heating have been provided, as mentioned above.

5. Information exchange
Generally, information exchange is crucial for the development of RES. The change agents described in the previous section use information campaigns and seminars in order to reach and inform the target groups. Certain seminars are also organized on a national level. According to many SEAPs, municipalities and regions will have to organize awareness raising events like energy forums. The aim of these events is to inform about the following issues:

- the formation of energy prices and parameters which influence consumers;
- the management of joint property;
- energy efficiency improvement measures in single apartment and in the whole building and possibilities to integrate RES technologies;
- the negative influence on human health by combusting wood with high moisture content;

6. Implementation figures
Concerning primary energy production from solid biomass, Latvia produced 1.741 Mtoe in 2012. The amount of solar thermal capacity installed is rather small and accounted for 4.3 MWth in 2012.

Detailed information is given in the good practices collected: The Cohesion Fund managed by the Latvian Investment and Development Agency has been used to support cogeneration power plants utilizing RES.

The biggest wood chip CHP (22 MWth, 4 MWel) in situated in Riga city and has been realized by “Rigas Siltums”, the biggest heat supplier in the Riga municipality. The annual woodchip consumption is around 152.000 m³. Woodchips are widely available in Latvia, representing a local renewable energy source at a competitive price.

7. Challenges / factors of success
The main challenges for district heating companies in Latvia are:

- Reduction of energy consumption due energy efficiency measures as well due shrinkage of many cities;
- Availability of capital to invest in long term projects;
- Integration of RES in buildings (heat pumps, solar thermal etc.);
- Knowledge and skilled workers;

Private house owners and small municipalities have to face different problems. Firstly, there is often a lack of knowledge about the benefits of renewable energy sources. Furthermore, it is often difficult to find skilled and well trained plumbers and installers. Another important point is the fuel quality, which often has to be enhanced.
Good-practice examples
On the basis of the analysis performed in WP2 as well as referring to the results of the questionnaire, the following good-practice examples were selected in Latvia (see annex for details):

- Wood chips CHP in Riga
- Flue gas condenser for biomass boilers
- Fuel switch project from gas boilers to RES – construction of new wood chip boiler house (7MW)
- Innovative business model for multi-apartment buildings for RES project and renovation implementation
- Recovery of the waste heat by large capacity heat pumps for Riga city district heating system

Literature

Findings Spain

The Spanish team interviewed the following key-stakeholders:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Contact Person</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Health</td>
<td>Mr. Jorge Jove</td>
<td>Chief of Solar Area</td>
</tr>
<tr>
<td>San Isidoro Basilica</td>
<td>Mr. Fransisco Rodríguez</td>
<td>Abbot</td>
</tr>
<tr>
<td>Municipality of Villaquilambre</td>
<td>Mr. Manuel García</td>
<td>Mayor</td>
</tr>
<tr>
<td>Spanish Biomass Association (AEVIOM)</td>
<td>Mr. Javier Diaz</td>
<td>Managing Director</td>
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<tr>
<td>EMINA Group</td>
<td>Mr. Emilio Moro</td>
<td>President</td>
</tr>
<tr>
<td>EREN</td>
<td>Mr. Alberto Fidalgo</td>
<td>Technician responsible of training courses, seminars in solar</td>
</tr>
<tr>
<td>EREN</td>
<td>Mr. Luis Diez</td>
<td>Chief of Energy Funding Department</td>
</tr>
<tr>
<td>Asturias Energy Agency (FAEN)</td>
<td>Mr. Jesus Donrroso</td>
<td>Responsible for EU projects, partner of STRATEGEO</td>
</tr>
<tr>
<td>Instituto Tecnológico de la Construcción (AIDICO)</td>
<td>Mr. Jose Cuevas</td>
<td>Responsible of project RENECITIES</td>
</tr>
<tr>
<td>Ministry of Industry, Commerce and Tourism</td>
<td>Ms. Virginia Vivanco</td>
<td>International Department (in charge of EU projects), Partner of project FRONT</td>
</tr>
<tr>
<td>Provincial Energy Agency of Burgos (APEA)</td>
<td>Ms. Luisa Martin</td>
<td>Director, partner of SUSREG</td>
</tr>
</tbody>
</table>

1. Policy framework

On a national level, an Aid Program for Energy Rehabilitation of existing buildings in residential sector (housing and hotels).

The program’s aim is to improve energy efficiency (thermal envelope, heating, lighting etc.) as well as the replacement of conventional heating systems. It is addressed to building owners (also including hotel owners) and Energy Service Companies (ESCOs).

The financial conditions are the following:

- Loans Interest rate: Euribor + 0.0%
• Maximum repayment period loans: 12 years (including a period of 1 year absence optional)
• Guarantee: guarantee or surety contract amounting to 20% of the loan amount.

Detailed information can be found in:

Moreover, the following programs have been found to be of great interest regarding RES H/C in Spain concerning the national level:

Program BIOMCASA II (the program promotes and finances thermal biomass projects in buildings)
Program GEOTCASA (promotion and financing of geothermal installations in buildings)
Program SOLCASA (financing solar installations in buildings of enabled companies)

Detailed information can be found in:

Program GIT (Grandes Instalaciones Térmicas)
The funding enabled companies to install large thermal RES installations in buildings, namely biomass, solar and geothermal applications. More information can be found in:
http://www.idae.es/index.php/id.638/relcategoria.1160/mod.pags/mem.detalles

PIMA SOL PLAN
This initiative aimed at the reduction of greenhouse gas (GHG) emissions in the Spanish tourism sector. Different kinds of action have been implemented, regarding envelope, windows, improvements in isolation, introduction of control systems in air conditioning and lightning, solar water heating systems, passive heating and cooling systems through better architecture, more efficient heating and cooling equipment, systems for efficient water management and other action to cause reductions in CO₂ emissions. The types of funding include loans and leasing, the repayment periods are 2-8 years. Detailed information can be found in: http://www.magrama.gob.es/es/cambio-climatico/planes-y-estrategias/Plan-PIMA-SOL-paso-a-paso _tcm7-330315.pdf

Despite the policy framework on a national level which is described above, there are regional plans in place which promote the use of renewable energy in heating and cooling:

HOSPISOL
Hospisol is part of the Solar energy Plan in Castilla y León which started in 2001. With the support of EREN, specific programs of subventions, technical regulations, trainings for professionals, information activities as well as gradual incorporation of solar energy installations in regional institutional buildings have been applied. More info: http://www.energia.jcyl.es/web/jcyl/Energia/es/Plantilla100DetalleFeed/1267710822752/Programa/1268897002747/Comunicacion

Promotion of changing Biomass boilers for local entities

The action is developed in the frame of the Bioenergy Plan of Castilla y León and approved by the Board of Government on 20th January 2010 (ORDER EYE/1635/2010; Measure.2.3.3 -. Setup biomass boilers in buildings of local entities). More info:
http://www.jcyl.es/web/jcyl/AgriculturaGanaderia/es/Plantilla100/1284155924472/_/_/
Important decrees and laws for RES H/C installations in Spain are the following:

- 410/2010 Royal Decree of 31 March (refers to requirements for quality control)
- General Register of Entities Quality Control Building ECCE
- 233/2013 Royal Decree of 5 April and 235/2013 Royal Decree of 5 April
- Corrigendum 235/2013 Royal Decree of 5 April, by which the basic procedure for the certification of the energy performance of buildings is approved.
- 238/2013 Royal Decree of 5 April, by which certain articles and technical instructions of the Regulation of Thermal Installations in Buildings, approved by Royal Decree 1027/2007, of 20 July amending, are modified.
- Corrigendum 238/2013 Royal Decree of 5 April, by which certain articles and technical instructions of the Regulation of Thermal Installations in Buildings, approved by Royal Decree 1027/2007, of 20 July amending, are modified.

2. Implementing Agency (Change agent)
In Spain, different implementing agencies are in place in order to promote RES H/C. One of the main change agents is IDAE (Instituto para la Diversificación y Ahorro de la Energía), which is responsible for the national Aid Program for Energy Rehabilitation of existing buildings in residential sector as well as for the programs BIOMACSA II, GEOTCASA, SOLCASA and GIT. The programs refer to solar thermal energy, biomass and geothermal energy.

Also on a national level, the Ministry of Agriculture, Food and Environment (MAGRAMA) as well as the Ministry of Industry, Energy and Tourism are relevant change agents responsible for the PIMA SOL PLAN. The technology concerned is solar thermal energy, biomass, geothermal energy as well as energy efficiency measures (insulation etc.).

Furthermore, DGEM (General Directorate of Energy and Mines) addresses all renewable energy technologies, and EREN (Regional Energy Agency of Castilla y León) focuses on solar thermal as well as biomass. Other notable change agents are the regional environmental minister (via SOMACYL) and business associations, distributors research centers etc.

3. Technology
Generally, biomass, solar thermal energy, and geothermal systems are addressed by the different systems described in the previous section. In detail, the following RES-H technologies are addressed in Castillia y León:

- Boilers supplied by pellets or chips, for households, council buildings, public buildings
- Few cases of biomass district heating installations (Regional Bioenergy Action Plan of CyL)
- Solar thermal for covering low temperature uses for hospital, individual households, sport buildings, apartments, geriatrics- Solar Energy Plan of CyL
- Geothermal: only some showcase installation of low enthalpy geothermal application in a building.
4. Incentives, cost aspects
The financing lines for the tourism sector and big installations address households, public buildings, industries and local entities and councils.

5. Information exchange
Information exchange has been stated as crucial for the implementation of RES H/C in Spain. The change agents use different communication methods in order to reach their target group. As an example, IDAE organizes information-days and website-announcements, the Ministries use press releases, EREN organizes expert-meetings, seminars etc.

6. Implementation figures
Concerning primary energy production from solid biomass, Spain produced 4.833 Mtoe in 2012. The amount of solar thermal capacity installed accounted for 2075.4 MWth in 2012 (of which 160.5 have been installed in the year 2012).

Detailed information on the factsheets can be found in the annex.

7. Challenges / factors of success
A lot of challenges for RES H/C were identified in Spain:

- Responsible persons of urban planning and building promoters regarding implementation have to be convinced of the usefulness of district heating system supplied by RES.
- The professional capacity of installers and other related professionals of the sector in the region has to be improved (Indicator: 1 capable professional for every 1000 inhabitants)
- The need of technical information for a tender to covering thermal demand by a sustainable energy system in public entities, minimum technical requirements, improvements etc. has to be covered (connected with the Covenant of Mayors)
- New investment in renewable system should not account as debt for public entities, if the repayment period is established with coherence.
- Rural communities in the region should be better informed about the possibilities of covering their thermal demand by a sustainable energy system.
- Unfortunately there is still a lack of trust from final users and consumers.
- Loans and leasing are accounted for as debt for local or other public entity
- There is often not enough interest for small installation (Preference of big installations with big investments)
- There are also not enough favorable normatives for the technical installations (for example chimneys).
- There should be clear procedures from the region in order to cover thermal demand of public buildings with renewable sources
- BIOMASS:
  - cheaper system of gases purification,
  - improve the software for multi fuel boilers in order to optimize temperature, air and other parameters automatically,
  - torrefaction as a previous step for biomass densification
- SOLAR:
  - architectural integration of panels,
  - lack of normative of thermal energy counters
GEOTHERMAL:
  o cheaper systems for drilling

**Good-practice examples**

On the basis of the analysis performed in WP2 as well as referring to the results of the questionnaire, the following good-practice examples were selected in Spain (see annex for details):

- HOSPISOL: A Programme for Sustainable Hospitals
- San Isidoro Church with an Innovative Biomass Heating System
- Mini-District Heating in Villa Romana of Navatejera School, León
- Use of Prunnings and Remains of Grape Vineyard for Thermal Energy in a Wine Cellar
- Training Program in Solar Thermal – Handbooks and Solar Thermal Dimensioning Software
- PLAN 2000 ESE

**Literature**
