

CODE2

**Cogeneration Observatory
and Dissemination Europe**



D2.1 Awareness Case Study **SLOVENIA**

November 2012



1. CHP in Slovenia

1.1. Current situation of CHP in Slovenia

According to the data from SURS¹, the production of electricity from CHP in 2011 equalled 1.145 GWh, which is 0,9% more than a year before and 31,3% more than in 2002, and production of heat 10.952 TJ. 36 CHP plants with a capacity of 337 MW were in operation that year, out of which 16 autoproducers.

Data from BORZEN, national centre, which administers support scheme for RES and CHP, show that there were 42 new CHP units with a total installed capacity of 6.662 kWe included in the scheme at the end of 2011 (Figure 1). The capacity of vast majority of these units (81%) was smaller or equal to 50 kWe.

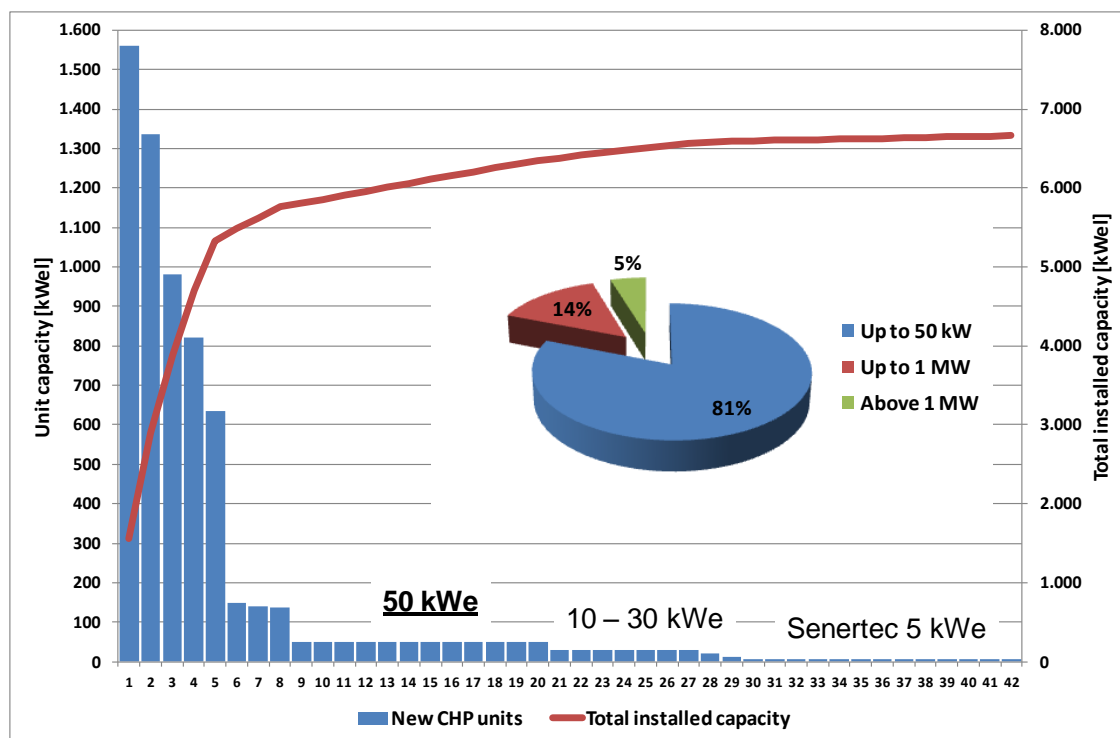


Figure 1: New CHP units included in the feed-in support scheme at the end of 2011

We can conclude that the introduction of the feed-in support scheme in Slovenia in 2009 has contributed to the installation of quite some number of new small scale CHP units especially in the service sector, including public sector. Because of the important impact of its support scheme on the recent fast development of CHP and a long tradition of cogeneration in industry and district heating, Slovenia was chosen as the best practice CHP Member State in the eastern European region (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) for this study.

¹ Statistical office of the republic of Slovenia. Data is prepared following the EUROSTAT methodology for CHP.

1.2. Slovenian national CHP policy

The fundamental document for CHP in Slovenia is Energy Law², which transposes CHP Directive into Slovenian legislation. It introduces also a feed-in support scheme, which is then more in detail defined in a special act on electricity from high efficiency CHP³. This act is the main CHP support instrument in Slovenia. After entering the scheme the units are entitled to receive the support for 10 years.

The first goal for cogeneration was included in the first national energy programme ReNEP – CHP electricity production should have doubled from 800 to 1.600 GWh yearly in the 2000-2010 period, while the goals until 2020 have not yet been adopted. In the proposal for the new national energy programme NEP for the period until 2030⁴, the goals are currently set to 18% share of cogeneration in the gross final energy consumption until 2020 and to 23% share until 2030. The extent of support for cogeneration in different economic sectors and using different fuels are more in detail described in the national energy efficiency action plan (AN URE), the national renewable energy action plan (AN OVE) and operational programme for limiting greenhouse gas emissions (OP TGP).

The Ministry of Infrastructure and Spatial Planning of the Republic of Slovenia, Energy regulator - JARSE⁵ and Market operator - Borzen⁶ are key public institutions responsible for CHP policy and support implementation in Slovenia.

2. Awareness of CHP in Slovenia

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Assessing current status of CHP awareness in Slovenia through performing interviews with a sample of the key actors dealing with cogeneration in Slovenia (state and local public administration, interest groups and cogeneration providers) has shown that the level of general public awareness about CHP in Slovenia is low, which is, however not true for the professional public, which knows the technology itself and procedures related to the implementation of a CHP project rather well (Table 1). In this study we therefore concentrate on one side on the general public awareness and on the other side on awareness of potential customers (industry, service sector etc.). At the end of this chapter also the key actors for promotion of cogeneration in Slovenia are presented.

² Energetski zakon (EZ), Ur.l. RS, [27/2007](#)-UPB2, [70/2008](#), [22/2010](#), [37/2011](#) Odl.US: U-I-257/09-22, [10/2012](#).

³ Uredba o podporah električni energiji, proizvedeni v soproizvodnji toplote in električne energije z visokim izkoristkom, Ur.l. RS, št. [37/2009](#), [53/2009](#), [68/2009](#), [76/2009](#), [17/2010](#), [81/2010](#).

⁴ Osutek predloga Nacionalnega energetskega programa Republike Slovenije za obdobje do leta 2030: »Aktivno ravnanje z energijo« (http://www.mzip.gov.si/fileadmin/mzip.gov.si/pageuploads/Energetika/Zelena_knjiga_NEP_2009/NEP_2010_2030/NEP_2030_jun_2011.pdf).

⁵ Energy Agency of the Republic of Slovenia, which is issuing declarations for CHP units (GoO) and provisions for the CHP support.

⁶ Centre for the RES and CHP support, which is managing also the feed-in support scheme.

2.1. General public

General public awareness about cogeneration is in Slovenia low. Except for the professional public and technical enthusiasts most of the people have never heard about this technology and if they did, they very often see it as a complicated and expensive technology causing additional noise, emissions etc. and not as, if properly designed, an efficient way for heat and electricity production or a green technology contributing to lower primary energy consumption and greenhouse gas (GHG) emissions.

In comparison to an energy efficient building envelope retrofit or an installation of a solar photovoltaic system CHP is an energy efficiency measure, which is not easy to be seen, so the word about best practice CHP projects goes mainly from mouth to mouth in a limited group. CHP projects are not presented by the media and the knowledge about this technology among journalists is also seen as low. As the people still mainly give advantage to the economic rather than environmental aspects of their own investments we could expect that the level of awareness will improve with smaller, households appropriate CHP units becoming more competitive. Higher general public awareness about cogeneration is therefore expected to be market driven.

Weak and rather declarative support of cogeneration by the state institutions is one of the drawbacks for its wider awareness although CHP is recognized as an important tool for fulfilling national energy efficiency and GHG emissions goals.

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2.2. Potential customers

At the moment we recognise as potential customers especially industry and services, including public sector⁷. As a potential for cogeneration lies also in multiple-dwelling residential buildings, we are shortly going to focus also on this potential CHP target group.

2.2.1. Industry

The level of awareness about cogeneration among energy managers in industry is in general high. They are especially familiar with CHP gas systems, while for the cogeneration using biomass (biomass gasification, ORC systems ...) there is still only limited information available. Despite this fact, there were lately no major new CHP units installed. The main reason for this currently lies in a lack of money for such investments. In comparison to the service sector, technology providers also don't want to offer cogeneration in industry via a business model of energy delivery contracting (EDC) as their risks due to uncertainty of the future industrial activity on the location are perceived as too high. So most of the current CHP units, mainly steam turbines, were installed in process industry (paper, chemical and wood) already in the seventies, with huge potential for retrofit and replacement with new gas turbines or combined cycle CHP units.

⁷ Limited potential still exists also in existing district heating systems.

2.2.2. Service sector (including public sector)

Awareness about cogeneration among potential customers in the service sector, including public sector, is still on a relatively low level, but improving fairly fast. This is proved by the fact, that the service sector is in last two years seeing a fast implementation of small units (prevailing size from 50 to 200 kWe) in hotels, restaurants, shopping malls, schools and homes for retired people. A lot of these projects were implemented using energy delivery contracting.

Potential customers can get the information about the technology as well as all procedures related to the implementation of a CHP project (Ministry of infrastructure and spatial planning, Borzen, JARSE) on the web, different expert workshops, and, of course, directly from the technology providers. The technology providers usually provide a potential customer with a bundle of information on technology, procedures, financing and feed-in-tariff support scheme. Still, this promotion of CHP is closely linked to the commercial benefit of technology providers, so it might happen that particular information is to a certain level misleading.

We can conclude that if the service or other sectors would receive a similar level of independent and objective information about CHP from government, as they are now receiving from technology providers, there is a good chance that a similar awareness raising could take place.

2.2.3. Multiple-dwelling residential buildings

Because of the higher heat consumption a potential for cogeneration exists also in the multiple-dwelling residential buildings. However, the level of awareness about cogeneration among constructors of new buildings and building managers is low. Besides that the implementation of CHP projects in the existing buildings is obstructed also by the ownership structure of such buildings and a high majority consensus is needed from the flat owners for the implementation of such projects. Especially constructors would need to widen their knowledge about possible building technologies in the area of heat production.

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Table 1: Overview of awareness about CHP among potential customers

Potential customers	Level of awareness	Level of implemented projects	Key obstacles to a higher CHP implementation
Industry	High	Low	<ul style="list-style-type: none">• Lack of money• EDC not attractive because of risks
Service sector	Fairly low, but improving	High	<ul style="list-style-type: none">• Project complexity
Multiple-dwelling residential buildings	Low	Low	<ul style="list-style-type: none">• Lack of awareness• Ownership structure

2.3. Key actors in promoting CHP

Technology providers, state, local energy agencies and some interest groups are the main actors in promoting cogeneration in Slovenia. Some other actors as for example financial sector and educational organisations are not very active in this area. The chapter ends with the

presentation of the influence the key actors in promoting cogeneration have on potential customers (Table 2).

2.3.1. Technology providers

There is no cogeneration production in Slovenia, and hence the technology providers importing this technology from abroad are the main cogeneration promoters. They promote cogeneration very actively through their web pages, presentations of their projects at different workshops and mainly through direct marketing to the potential customers. They usually provide a potential customer with full information on technology, procedures, financing and feed-in-tariff support scheme. Still, as this promotion is closely linked to the commercial benefit of technology providers, it might happen that particular information is to a certain level misleading. Current technology providers are mainly promoting gas cogeneration, only 1 or 2 have also a knowledge for implementation of biomass fuelled CHP units. It is interesting that natural gas suppliers themselves (not their economic interest grouping) are still quite passive in promoting this technology, although it could contribute to their higher gas sales. Most of the technology providers offer to their customers a possibility to implement a CHP project using a business model of energy delivery contracting.

2.3.2. Financial sector

The financial sector is regarding cogeneration still very cautious (lack of proper knowledge/understanding, too complicated, too high risks), which makes borrowing money from banks for CHP projects very difficult both, for potential customers and technology providers offering energy delivery contracting.

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2.3.3. Education

On the educational level cogeneration is included in some of the studies of different Slovene technical universities, but more or less on a technological level and not from the comprehensive point of view. Some more knowledge about multiple aspects of cogeneration is given in a once a year European Energy Manager (EUREM) training organised by the Jožef Stefan Institute, Energy Efficiency Centre (JSI-EEC).

2.3.4. Research

As there is no cogeneration industry in Slovenia, there is no direct research on this topic. The most active research institutions in this area are Jožef Stefan Institute, Energy Efficiency Centre (JSI-EEC), including authors of this paper, which acts also as the COGEN Slovenia, and Faculty of Mechanical Engineering at the University of Ljubljana, which has specialised in bigger trigeneration units and district cooling.

2.3.5. State engagement/Policy

Slovenia is a small country so the regulation and support related to cogeneration are centrally controlled and do not differ for different regions. The most important factor helping in raising

awareness about CHP in Slovenia is, of course, the feed-in support scheme. Also the most information about cogeneration that potential customers can get on the state level is related to the procedures needed for the implementation of CHP projects, not on the technology itself. The main actors for promotion of cogeneration on a state level are:

- **Ministry of infrastructure and spatial planning** as the main regulative body for cogeneration (promotion through the web page, personal contact);
- **Energy Agency of the Republic of Slovenia – JARSE** (regulator), which is issuing declarations for CHP units (GoO) and provisions for the CHP support (promotion through the web page, personal contact);
- **Borzen** – a centre for the RES and CHP support, which is managing the feed-in support scheme (promotion through the web page, brochures, presentations at workshops, personal contact).

Besides the direct promotion of cogeneration by the state there are also three interest groups worth mentioning:

- Jožef Stefan Institute, Energy Efficiency Centre (JSI-EEC) as **COGEN Slovenia** - Slovenian national member in COGEN Europe, which is the European Association for the Promotion of Cogeneration (promotion through the web page, brochures, European projects, organisation of and presentations at workshops, EUREM training, feasibility studies, personal contact)⁸;
- **Economic interest grouping of natural gas suppliers** (GIZ DZP), which is promoting use of natural gas (promotion through the web page, organisation of and presentations at workshops, personal contact);
- **Slovenia District Energy Association** (SDDE), which links companies and individuals working directly or indirectly in the field of district energy supply. We have to point out, that the largest share of heat supply delivered by cogeneration in Slovenia comes from the district heating sector, where since 1999 several new small CHP units (mainly internal combustion engines) were installed in smaller district heating systems whereas the largest two systems in Ljubljana and Velenje are traditionally supplied by large coal CHP plants.

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2.3.6. Local engagement

Local energy agencies are the most important organisations promoting CHP on the local level. Their role is mainly informing, training and presenting best practice examples to the potential technology users as well as technology providers, constructors and designers of building technology systems. It is especially important that these agencies emphasize the importance of proper design of CHP units and thus support the sustainability of cogeneration projects.

According to the Slovene regulation Slovene municipalities are obliged to prepare local energy concepts and follow therein included plans for municipal energy supply. The content of this concept therefore already to a certain extent defines, whether there is a possibility for

⁸ JSI-EEC has good links and access to the industry and the public sector, which is very important for the CHP awareness due to absence of industry associations dealing with cogeneration in Slovenia.

cogeneration or not, but the decision on whether to include this technology into the local energy concept or not still too often lies with the organisation preparing the concept.

A very important role in promoting cogeneration with the general public at the local level could in the future also be **ENSVET** - the network of energy advisory offices for citizens.

Table 2: Current influence of key actors in promoting cogeneration on potential customers in Slovenia

Potential customers Key promotion actors	Industry	Service sector	Multiple-dwelling residential buildings
Technology providers	Middle	High	High
Financial sector	None	None	None
Education	Middle	Low	None
Research	High	Low	Low
State institutions	Middle	Middle	Low
Interest groups	High	High	Low
Local energy agencies	Low	High	Middle

3. Best practice cogeneration cases

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Projects from a hotel and a small enterprise were chosen as the best practice cogeneration cases for Slovenia. In **Hotel Mons** in Ljubljana they decided to invest into a cogeneration unit (150 kWe, 230 kWth) in order to decrease energy costs and protect the environment and thus follow their efforts for a sustainable development. The specificity of this project otherwise lies in special requirements for a low noise level in the hotel rooms, which demanded special precautions for minimizing noise and vibrations in the boiler house. The second case comes from the small sized **company Riedl** from Maribor, which is specialised for the production of small metal products. The company uses a 49,9 kWe CHP unit as the only heating source for heating of the industrial hall, and also all produced electricity is entirely used on-site. Both best practice cases are presented more in detail in appendix 1.

3.1. Cost/benefit analysis of the best practice cases

The cogeneration project in Hotel Mons was entirely financed from the customer's own funds. The CHP unit was put into operation in autumn 2011 and it entered in the feed-in support scheme only at the end of winter 2012. Because of that this CHP unit, which is dimensioned to work only during the heating season, when all the heat produced can be used, has not yet met all of planned technical, financial and energy parameters. However, it is expected, that the system is going to be operate as planned this heating season. This results in a payback period

for this project of approximately 5 years taking into account the current level of the operating premium from the feed-in support scheme.

The industrial hall Riedl project is dimensioned according to the heat needed and is, similar to the system in the Hotel Mons, planned to operate only during the heating season. This project was entirely financed from the investor's own funds. So far all expected technical, financial and energetic parameters of the project have been met and the project proved to be even better than expected. The system entered the feed-in support scheme on 1st January 2012 and the estimated payback period for the project, again taking into account a current level of the operating premium from the feed-in support scheme, is from 4 to 6 years.

Generally speaking, if the systems are dimensioned properly, using all of the produced heat during their operation periods, and taking into account the current level of the support from the feed-in support scheme their payback period is estimated to be from 4 to 6 years, also depending on the financial source of the projects (own funds, bank loans). However, if the system is not dimensioned properly and it turns out to be too big, that means that not all of the heat can be used, the payback period can extend to 7 or even 10 years. Proper dimensioning of CHP systems is therefore crucial for their acceptable payback times. Contracts for CHP projects, which are implemented via a business model of energy delivery contracting, are usually concluded for a period of 8 to 10 years.

4. Importance of Awareness in CHP success in Slovenia

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We can without doubt claim that the feed-in support scheme is the main reason for increasing implementation rate of CHP units in Slovenia, especially in the service sector. The support has made this technology sufficiently attractive for investors and thus also for the technology providers. Through the availability of the support also the awareness of the potential customers is rising, partly because of the information available from state institutions (Ministry, JARSE, Borzen) and interest groups (COGEN Slovenia, GIZ DZP, SDDE) and partly because of the information available from the technology providers, who have commercial benefits from selling this technology.

Despite the fact that cogeneration is an efficient and "green" technology, it must be clearly financially attractive for it to gain market share, especially for very small units for households. Financial attractiveness is one of the key preconditions for increasing of currently very low awareness about cogeneration in general public.

Improved awareness and knowledge about cogeneration of banks and other financial institutions is one of the key challenges for further implementation and financing of CHP projects in Slovenia. Strengthening of the state promotion and availability of independent quality information of this technology – perhaps even establishing an information centre for cogeneration through either Borzen or JARSE, could significantly contribute to the wider awareness and faster CHP implementation.

Appendices:

1. Case studies

- CHP in Hotel Mons, hospitality sector
- Industrial hall Riedl, manufacturing

2. List of market stakeholders important for creating CHP awareness and their current activities

CHP IN HOTEL MONS

Hotel sector

Main CHP plant indicators

Electrical capacity (total)	kWe	150
Heat capacity (total)	kWth	230
Technology	Motor engine	
No. of units	1	
Manufacturer	Ener- G	
Type of Fuel	Natural gas	
Electricity (yearly generation)	MWh	600
Heat (yearly generation)	MWh	944
Year of construction	2011	
Total investment costs	EUR	-
Financing	Own funds	
State support	Feed-in tariff	
Location	Ljubljana, Slovenia	
Information	http://www.energen.si	

Picture



General description of the case

Hotel Mons decided to invest into a cogeneration unit in order to decrease energy costs and protect the environment and thus follow its efforts for a sustainable development. Because of the special requirements for a low noise level in the hotel rooms, special precautions had to be taken to minimize noise and vibrations in the boiler house. The CHP unit was thus placed on special anti-vibration pads and the boiler house itself was additionally soundproofed. Both, produced heat, which is used for heating and preparation of sanitary hot water, and electricity are used on-site. It is planned, that the system is going to operate approximately 4.000 hours per year. The CHP project in Hotel Mons was carried out by a company Energen, which also took over the maintenance of the system for the next 10 years.

Success factors

By means of legislation or state support for electricity production in CHP plants, the Hotel Mons achieves high savings since all produced electricity is used on-site and the investor receives operational support for the period of 10 years.

Main barriers

Main barriers encountered during the implementation of this project are related to the obtaining of an agreement for the connection of an individual building where CHP is installed to the electrical grid. This procedure namely usually takes a lot of time. Also separate procedures for obtaining declaration and support for the production facility, which can start only after the facility has already been given an operating permit, are time consuming.

Conclusions

Cogeneration can represent high savings and therefore an interesting investment, however, it is very important that the CHP unit is properly dimensioned and that there is a competent partner involved in the project during its implementation and the whole maintenance period.

INDUSTRIAL HALL RIEDL

Manufacturing

Main CHP project indicators

Electrical capacity (total)	kWe	49,9
Heat capacity (total)	kWth	78
Technology	Motor engine	
No. of units	1	
Manufacturer	Senergie	
Type of Fuel	Natural gas	
Heat (yearly generation)	MWh	312
Electricity (yearly generation)	MWh	200
Year of construction	2011	
Total investment costs	EUR	85.000
Financing	Own funds	
State support	Feed-in tariff	
Location	Maribor, Slovenia	
Information	http://www.riedl.si http://www.megaenergija.si/	

Picture



General description of the case

Company Riedl is a small enterprise specialised for the production of small metal products. The owner of the company has established also a company Megaenergija, which is offering innovative solutions for electricity and heat production using high-efficiency cogeneration. Since 2010 the company has carried out approximately 20

cogeneration projects, mainly in the service sector. Most of the projects were successfully implemented using a business model of energy delivery contracting (EDC).

In 2011 Megaenergija installed a 49,9 kWe CHP unit also in the industrial hall Riedl. System is as the only heating source operating only during the heating period and all produced heat is used for heating of the industrial hall. Also all produced electricity is entirely used on-site and the remainder needed is bought from the grid. The system entered the feed-in support scheme on 1st January 2012 and the estimated payback period for the project is from 4 to 6 years.

Success factors

The state supports high-efficiency cogeneration as the technology that reduces primary energy consumption via the feed-in support scheme. The scheme is at the moment the main driver for the CHP projects, though for the implementation of smaller units it might be good to introduce more capacity categories as now there are only two: micro (≤ 50 kWe) and small (≤ 1 MWe) units.

Main barriers

There were no major barriers encountered during the implementation of this project. The procedures of obtaining a declaration and support for the production facility from the Energy Agency of the Republic of Slovenia ran smoothly.

From the general point of view is the main barrier for the implementation of such projects still a lack of money and also insufficient information about cogeneration among potential customers.

Conclusions

The project proved to be even better than expected. Even in transition periods, when it can happen that the system occasionally produces more heat than needed, the exceeded heat is accumulated in the well designed building shell. So far all expected technical, financial and energetic parameters of the project have been met.

Appendix 2

List of market stakeholders important for creating CHP awareness and their current activities

Market stakeholder	Activities
State institutions	
Ministry of infrastructure and spatial planning	Web page, personal contact
Energy Agency of the Republic of Slovenia (JARSE)	Web page, personal contact
Borzen	Web page, brochures, presentations at workshops, personal contact
Interest groups	
COGEN Slovenia	Web page, brochures, European projects, organisation of and presentations at workshops, EUREM training, feasibility studies, personal contact
Economic interest grouping of natural gas suppliers (GIZ DZP)	Web page, organisation of and presentations at workshops, personal contact
Slovenia District Energy Association (SDDE)	Web page, organisation of and presentations at workshops
Others	
Technology providers	Web pages, promotional leaflets, presentations at workshops, feasibility studies, personal contact
Financial sector	No activities
Educational institutions	Certain studies in technical faculties, EUREM training
Research institutions	Web pages, European projects, feasibility studies
Local energy agencies	Web pages, presentations at workshops, personal contact
Network of energy advisory offices for citizens (ENSVET)	Personal contact