CONCERTED ACTION
ENERGY EFFICIENCY
DIRECTIVE

Article 14.1 Comprehensive assessment at national level Article 14.5 Cost benefit analysis at installation level

Executive Summary 7.4

Efficiency in energy supply

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1 Summary

As well as general discussions on the implementation of article 14, this research focused on the following key topics:

- Comprehensive assessments at a national level (article 14.1)
- Cost-benefit analysis at a national level (article 14.1) and at installation level (article 14.5)

A questionnaire issued ahead of this research was sent to all MS: a total of 18 Member States (MS) provided answers to all or part of the questionnaire. The survey responses show steady progress in the implementation of the Energy Efficiency Directive (EED) at MS level. However, it also shows that a large number of MS still struggle with the initial stages of implementation, such as determining the methodologies to be applied.

In terms of the comprehensive assessment, cooling demand assessment still remains a major challenge for most MS. Also at this stage, only a few MS have planned how to make use of the comprehensive assessment in developing new policies and regulation.

Recent approaches and methodologies[1] include:

- Heat Roadmap Europe and its successor STRATEGO have developed approaches for the mapping of district heating and cooling demand even at MS level.
- The GEODH project provides mapping of the potential for geothermal for district heating purposes
- The SDHPlus project provides cases of cost-benefit analysis (CBA) for solar heating plants for district heating
- The European Commission (EC) has launched a project to develop a CBA tool for use by MS in their implementation of art. 14. The current status of the project was presented in Milan.

Note: STRATEGO, GEODH and SDHPlus are projects supported under the Intelligent Energy Europe (IEE) programme of the EC. For more information on the projects see http://ec.europa.eu/energy/intelligent/projects/?/page/Page.jsp

[1] The Powerpoint presentations can be found at: http://www.ca-eed.eu/good-practices/member-state-presentations/chp and http://www.ca-eed.eu/good-practices/member-state-presentations/chp/article-14.1-national-and-instalation-level. Further details are also given in Section 3 below.

2 Conclusions

Over the last two years, the work within Core Theme 7 (CT7) has introduced a wide range of methodologies for the mapping of heating and cooling as well as technical and economic potential assessments, including methodologies to perform CBA. Since most MS have barely started developing their comprehensive assessments, these methodologies may provide a sound basis for them to begin designing their approaches.

Further work on art. 14.1 in CT7 should focus more on the discussion of actual problems and challenges anticipated or envisaged by MS, for example through dedicated sessions on specific topics. Further work on the preparatory and analytical elements of annex VIII (a-f) of EED could become relevant once a critical mass of MS is working on the issue. There may also be a need to focus on the development of strategies, policies and measures that could be adopted up to 2020 and up to 2030 to realise the potential for the application of high-efficiency cogeneration and efficient district heating and cooling (annex VIII, g (i-vi)).

Following the development of the comprehensive assessments, MS should adopt policies and regulatory measures according to their findings. Although few MS are at this stage yet, it is believed that research could play an important role as a forum for sharing views and experiences of the development of policies and regulation.

With regards to art. 14.5, a small number of MS already have a way of working with CBA, while the majority have not yet started working on developing methodologies.

Conclusions include:

- Several good practice examples illustrated a huge untapped potential for efficient heating and cooling in the EU that should be considered by MS. Results of ongoing and completed EU financed projects could contribute to the successful implementation of the requirements of article 14.

- A CBA methodology is under preparation by the Directorate-General Joint Research Centre (DG JRC). A guidance document is planned, to be available in January 2015. This work is welcomed in order to support and provide (voluntary) guidance for CBA implementation at a national and at installation level, where clarification of different aspects would ease implementation in MS.

3 Practical examples

The examples below were presented in October 2014. Please find the power point presentations at the following websites: http://www.ca-eed.eu/good-practices/member-state-presentations/chp and http://www.ca-eed.eu/good-practices/member-state-presentations/chp/article-14.1-national-and-instalation-level.

3.1 District heating potential assessment – Heat Roadmap Europe and STRATEGO

Heat Roadmap Europe (www.heatroadmap.eu) analysed the potential role of district heating and cooling in the future EU energy system, under 1) today's energy system configuration, 2) a business-as-usual scenario to 2050, and 3) a decarbonised EU energy system that can achieve an 80-90% reduction in greenhouse gas emissions. The analysis combined hourly energy system **modelling** of the electricity, heating and transport sectors, with detailed **mapping** of local heat demands and surplus heat resources. The results indicate that under a business-as-usual trajectory, district heating can:

1. Reduce energy system costs
2. Reduce fossil fuel consumption and imports
3. Reduce carbon dioxide emissions
4. Increase renewable energy
5. Create more jobs in the EU

The key reason for these improvements in an energy system with district heating (DH) is energy efficiency. District heating enables surplus heat, which already exists in the energy system, to be captured and moved into buildings, replacing other fuels that are currently used for heat. For example, district heating can capture surplus heat from a power plant, waste incinerator or industry, and use this to replace fuels such as natural gas.

District heating has a very visible and large initial capital cost, primarily due to the development of the heating network. However, when the total costs of a district heating system are compared to the alternatives, primarily natural gas, our analysis indicates that district heating can reduce the costs of the energy system. The heating network may be more expensive than the gas network, but the cost of individual heat exchangers is cheaper than individual gas boilers in addition to the fact that the cost of surplus heat (i.e. the fuel for district heating) is cheaper than natural gas.

In the second Heat Roadmap Europe project, the costs of a decarbonised EU energy system were calculated with and without the use of district heating. The results indicate that district heating could reduce the annual costs of the EU energy system by €100 billion/year. In addition to the cost savings mentioned previously, these savings are also possible because the cost of supplying heat from district heating proved less expensive than other heat saving options in buildings.

Many of the tools developed in the Heat Roadmap Europe project are now being translated to an MS level in the STRATEGO project (http://stratego-project.eu/) so that a similar analysis can be carried out for individual countries in the EU28. The modelling software used in the Heat Roadmap Europe project is distributed freely from its homepage (www.EnergyPLAN.eu) and already includes many models of individual MS: http://www.energyplan.eu/models/. In addition, the new heating and cooling maps developed for the EU are currently being redesigned to provide data at MS level. These can be accessed from the Heat Roadmap Europe homepage: http://heatroadmap.eu/.

Main conclusions following this presentation:

- Sufficient heat demand data is available for the assessment of opportunities for DH across most of the EU

- Heat sector analysis should not be carried out in isolation, but should rather be included and integrated in the analysis of the entire energy sector. All energy sector perspectives (e.g. electricity and cooling demand in industry and transport) should be taken into account. The long term obligations beyond 2030 should also be considered, as the life time for investments in the heating sector may go beyond 2030.

A Heat map of EU27 is already available. MS should consider to what extent these data are appropriate for use as part of national Comprehensive Assessments (art. 14.1).

3.2 Geothermal heat potential in the EU: Findings and approaches used in the GEODH project

The potential for deep geothermal is significant. However, geothermal district heating (GeoDH) technology is at present poorly developed. The crucial challenge is to promote GeoDH in Europe and to facilitate its penetration to the market. The more than 240 GeoDH plants in Europe have a total installed capacity of more than 4.3GWth and a production of some 12900GWh.

The European GeoDH market can be divided into three segments:

Mature markets. Several European countries (Germany, France, Hungary and Italy) have a long tradition in GeoDH and have set ambitious 2020 targets. In order to reach these targets, simplification of procedures and more financing is required.

Transitional markets. There are several Eastern and Central European countries, such as Poland, Slovakia, and Romania with GeoDH systems installed. However, the potential is much larger.

Juvenile markets. A third group of EU countries includes those MS currently developing their first GeoDH systems, such as the Netherlands, UK, Ireland, and Denmark.

In other MS there is no tradition of GeoDH so the market conditions for its development need to be established. In other Eastern and Central European countries, including Bulgaria, the Czech Republic and Slovenia, there is a need to convince decision makers and to adopt the right regulatory framework and also to establish the market conditions for the development of the GeoDH market.

Enabling growth

Three key areas have been identified as important to enable growth for GeoDH:
- The removal of regulatory barriers and simplified procedures for operators and policy makers.
- The development of innovative financial models for GeoDH projects, which are capital intensive.
- The training of technicians and decision-makers in regional and local authorities in order to provide the technical background necessary to approve and support projects.

In addition, it is important that a **level playing field** is established by liberalising the gas price and taxing greenhouse gas emissions in the heat sector appropriately.

The GeoDH project (2011-2014) works on these issues, involving several stakeholders including:
- Policy and decision makers of national authorities to be aware about the potential of this technology
- Decision makers from municipal and local authorities and energy authorities to have a better regulatory framework and simplify the procedures at a local level
- Banks, potential investors and other market players to stimulate investment in the sector

To obtain further information concerning the GeoDH project please visit the project website http://geodh.eu/. This includes a link to the GIS based mapping of the potential for geothermal for district heating purposes, case studies, training manuals and information on business models and financing mechanisms for geothermal district heating projects.

Main conclusions following this presentation:

- There is a huge untapped geothermal potential which could supply up to 25% of the EU27 population. MS should consider to what extent these data are appropriate for use as part of national Comprehensive Assessments (art. 14.1).

3.3 Solar district heating projects: CBA analysis of the SDHPlus project

Solar district heating (SDH) plants are a large-scale solar thermal technology supplying renewable, zero-emission heat from large collector fields via district heating networks to residential and industrial areas in villages and cities.

Long term experience is available from demonstration projects in Sweden, Denmark, Germany and Austria. The commercial application of SDH is presently growing in some countries, particularly in Denmark where 35 plants were built, representing a total capacity of 264 $MW_{th,}$ between 2010 and 2014. Several other MS are now introducing SDH, for example in Italy, France, Spain and Norway.

The SDHPlus project (2012-2015) aims to promote, create and pilot the implementation of new and innovative business opportunities and market strategies for solar thermal district heating. The project relies on knowledge transfer from experienced to newcomer countries, and in the drafting of case studies targeting the starting point of each participant country for the integration of SDH. The project will also provide guidance to urban planners on the planning aspects and implications of SDH in urban contexts.

In particular, the IEE project has developed
- Business models for solar district heating
- Case studies for 'first-of-its-kind'-plants and innovative DH net integrations
- Marketing approaches for district heating with solar heat
- One-to-one coaching for learning countries (Spain, France, Croatia, Lithuania, Poland and Slovenia)
- International SDH conferences and workshops

To access the material developed in the SDHPlus project please visit the project website http://www.solar-district-heating.eu/.

At the Milan PM, SDHPlus staff discussed plant feasibility and CBA at project level, both of which play a key role for market introduction.

Main conclusions following this presentation:

- CBA at installation level is useful for a general feasibility assessment. It is important to assess sensitive parameters such as interest rates, size of investments and life time of major components and to compare the proposed solution with alternative possibilities

- Heat prices and economic/financial viability vary a lot according to SDH plant types and actual design

- CBA depends on the legal and regulatory framework in MS

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The Concerted Action for the Energy Efficiency Directive (CA EED) was launched by Intelligent Energy Europe (IEE) in spring 2013 to provide a structured framework for the exchange of information between the 29 Member States during their implementation of the Energy Efficiency Directive (EED).

For further information please visit **www.ca-eed.eu** or contact the CA EED Coordinator Lucinda Maclagan at **lucinda.maclagan@rvo.nl**

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