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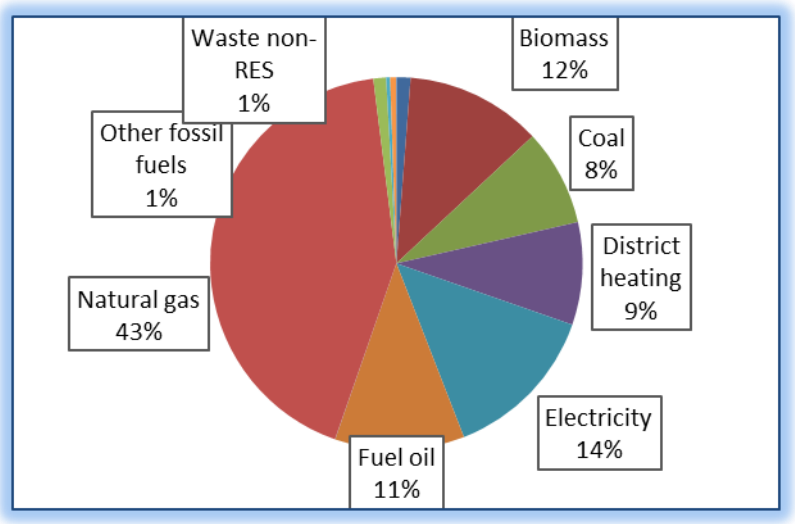
CEDEC Position Paper

An EU Heating and Cooling Strategy



Source: European Commission

Introduction

Heating and Cooling largest single source of energy demand

Heating and Cooling accounts for ca. 46% of Europe's final energy demand.[1] Heating and cooling of homes is also a vital service to consumers, which accounts for a large part of their energy bill and household incomes in many Member States. It's therefore important to move this sector to the center of European energy policy, with the triple aim to ensure security of supply and a compatibility with the European decarbonisation agenda as well as an acceptable price level for the consumers.

Heating and cooling are local

By nature, heating and cooling is a very local sector, as the availability of heat sources and infrastructure as well as demand for heat depends by and large on the local circumstances. Heat and cooling energy can be transferred over limited distances only. Additionally, there can be very different opportunities in local and rural areas. Despite this local nature, however, there is a EU-wide dimension to heating and cooling. From a regulatory side, the decarbonisation and environmental targets need to be attained and hence the interplay between European and national and local policies is crucial. From a market side, evolutions on local level have impacts on i.e. the level of fuel imports, such as gas, used for heating in many parts of Europe, and its allocation.

[1] European Commission brochure on heating and cooling in the energy transition, February 2015

Heating and Cooling goes beyond the building renovation

On the European level, heating and cooling policies traditionally had a very strong focus on buildings and their energy performance. While the efficient energy consumption on-site is clearly one side of the coin, a focus on the supply side, hence an efficient and sustainable use of primary energy, is equally important and many potentials remain yet untapped. Therefore, in an EU strategy, a balanced approach to demand and supply approaches is essential. Allowing for a primary energy perspective in all policy measures ensures that supply side and demand side improve and potentials are equally considered and weighed against each other for costs and benefits.

Local players for local solutions

CEDEC member companies as local multi-utilities are active along the whole value chain of the heating and cooling sector: They are producers of heat, suppliers of heat, gas and electricity and related services and operators of the respective infrastructures. Being rooted in the local context of cities and regions, besides their technical know-how, they have a very good overview of local situations, availability of resources, topology of infrastructures, economic conditions, etc. Moreover, due to their ownership structure they operate close to citizens and are subject to their scrutiny as shareholders, thus they have an additional social and macroeconomic perspective. Finally, as local authorities play a significant role in local planning and permission procedures, local energy companies can offer their technical know-how and assist in developing the best solutions in their territory. With this rather holistic approach to the sector on a local level in many parts of Europe, local energy companies are crucial partners for the European Commission in the development of an EU Strategy that effectively links all governance levels in pursuit of the European climate and energy targets.

A strategy for integrated, sustainable and efficient local heating systems:

When discussing heating and cooling issues one should take a holistic view, across systems and against the background of the energy system. Local potentials of heating and cooling sources are different, in Europe, so is the demand for heating and cooling services. Extensive infrastructures already exist and should be used as economically and efficiently as possible.

Another consideration is the development of the heating and cooling sector in the coming years. The EU has an ambitious climate and energy agenda with targets for GHG emissions to meet. According to the scenarios in the EU's 2050 energy roadmap, the energy demand in the heating and cooling sector needs to be reduced by 40-70% by 2050, depending on the scenario.[2] This demand reduction

[2] EU energy roadmap 2050

is of much higher scale than in the electricity and transport sectors and can only be attained by both a reduction in final energy demand and the reduction of primary energy.

While numerous studies suggest that heat/cooling energy demand can be significantly reduced by renovation of buildings and more efficient consumer end-products, it may not always be the most-effective solution. A study for the European Commission showed that above a demand reduction of 30-50%, a sustainable supply of heat is actually more cost-efficient than further demand reduction.[3] Hence, there is a trade-off between demand-/supply-side solutions that needs to be carefully considered in the development of Europe's heating and cooling strategy to reach an optimal mix of measures reducing final energy demand and attaining sustainable production while minimizing costs for the customer.

It goes without saying that consumers should have a choice and should not be forced into a certain technology. However, it is crucial to look beyond the most suitable solutions for single households and take a broader view and look at possible collective solutions on street/district/city level. The most economically valuable and sustainable solutions can only be evaluated on the scale a potential measure is going to be carried out and some potentials are better leveraged at a collective level.

Differences also exist between rural and urban areas. In densely populated urban areas, collective technologies such as district heating/cooling are much easier to deploy than in rural areas with long distances between demand sources. Again, the availability of heat sources, for instance waste-heat from industrial process or the location of heat/cooling energy generating plants, is key in planning.

[3] European Commission, 2015, Issue Paper V - Integrated Planning and mapping and scenarios for heating & cooling

Exploit technology variety

A wide array of technologies for meeting heating/cooling energy demand exist and are operational in Europe. Some require a public infrastructure in place (gas, district heating, large heat pumps), while others can be used independently on an individual basis. Local energy companies offer services for deploying all of these technologies and therefore take a technologically-neutral approach to the debate. From a local public company point of view, the most technological-, economic- and ecologic-optimal should be promoted. There will be no one-size-fits-all solution for Europe, rather the deployment of single technologies depends on the local circumstances and for the most part on the available infrastructures. Maintaining and developing collective infrastructures is capital-intense and therefore these should be most efficiently and effective used and implications of measures on the existing infrastructures should be carefully assessed.

<u>District heating</u>

District heating has been praised for its efficiency and the wide set of technologies that can supply heat through this network. As a matter of fact, in densely populated areas where heat demand is high during certain periods of the year, it's a cost-efficient and sustainable solution for heat provision. Furthermore, district heat can be supplied by sources such as biomass, large heat pumps, geo and solar thermal, waste plants and waste heat from industrial processes, integrating renewable sources into district heating systems. By far the largest share derives from combined heat and power

plants, mostly operated on gas. Due to a high efficiency factor of modern CHP plants, they can reach savings of 30% primary energy compared to separate production of electricity and heat. In rural areas in absence of a district heating network they are mostly decentralized plants, operating close to consumption centers and hence have fewer grid losses than plants further away. In the context of district heating in city regions there are large scale CHP plants in operation, with in principle lower specific costs and the prevention of local emissions. Furthermore, due to its various possible input fuels, CHP is a proper technology to bridge the gap from fossil to renewable heat production.Local energy companies have traditionally been very active in investing in district heating networks and combined heat and power plants. Due to the currently very low wholesale electricity prices and the absence of a meaningful price signal from the Emission Trading Schemes, many highly-efficient and flexible gas CHP plants run at a loss and make the provision of heat an uneconomic yet essential business. Modern CHP plants, close to the demand centers offer reliable and sustainable services for heat provision. Especially in combination with large heat storages they can play a key role in the integration of variable renewable energy and can effectively link electricity and heat networks, providing system flexibility (see below).

District cooling

Today, Europe's cooling sector is largely dominated by electric cooling machines. Most cooling energy demand appears in the tertiary sector, i.e. larger office buildings.

However, in some cities, like Vienna Paris and Stockholm, where a growing demand is expected, district cooling networks have been developed and extended by local companies, primarily for office and larger public buildings. District cooling networks in this regards are sustainable and economic solution. Compared to traditional cooling technologies, district cooling systems can reduce CO_2 emissions by up to 74% due to a low input of primary energy. The district cooling is generated in highly-efficient cooling machines and absorption refrigeration that transforms surplus heat from waste-to-energy or CHP plants into cooling energy that is transported to demand centers through cooling networks. [4]Beyond this district cooling can also be generated by free cooling using for instance ground water sources and watercourses, which is implemented by the local public utility in Munich, for example. Furthermore, efficiency and ecological benefit of district cooling systems can be raised by using ice storage units.

Gas heating

Gas, is the dominant heat supply source in many EU Member States: 43% of demand was covered by gas in 2012 in the EU.[5] Europe`s dependency on gas imports from external suppliers has been heavily criticized in the past, but at the same time, a large and costly infrastructure is in place in many Member States and has provided reliable and efficient services to consumers. Although gas demand is projected to decline in the coming decades, gas networks can also provide more sustainable

[4] Wien Energie, 2015

[5] European Commission, 2015, Issue Paper V - Integrated planning and mapping and scenarios for heating & cooling

heating solutions to customers than it is the case today. While today 85% of the EU's boilers are rather inefficient non-condensing ones, the efficiency in primary energy use can be improved by about 20% by a replacement with modern condensing boilers.[6] With the right incentives for in place, an acceleration of the replacement with modern boilers can make gas heating much more efficient and reduce greenhouse gas emission as well as the need for imports.

Moreover, a "greening" of gas is in progress. In recent years, the production of biogas in Europe has increased, especially in some countries such as Germany and Italy, with almost 14 billion m³ being produced in Europe and set to increase to 28 billion m³ in 2020 according to the National Renewable Energy Action Plans (NREAPs). Biogas, being transformed into biomethane can be fed into the existing gas infrastructure and be used as a substitute for natural gas for heating demand. The gas infrastructure is therefore supporting the deployment of renewable gases, and can complement the integration renewable electricity when efficiently linked (see below). In city regions, large-scale CHP plants which run on biogas at low specific costs and low emissions are connected to district heating networks.

Electrification

It is often argued that electrification of heating can be an important tool to make the heating and cooling sector more sustainable. In fact, while electricity heating and cooling is common in some Member States, it can bring immense stress on the electricity network side as regularly experienced in France on cold winter nights. During times of high heat demand, the stability of the national electricity grid has been challenged immensely and making a high demand-side management capacity a necessity . Moreover, the power generation fleet depends on a high degree of flexible and dispatchable power plants as well as electricity imports from neighboring countries thus driving the need for back-up power plants in many cases run on fossil fuels. As the electricity infrastructure in most Member States is not designed for extreme peak demands and other infrastructures exist, a large-scale electrification of the heating and cooling sectors seems neither feasible nor economic or ecologic.

Renewable technologies

Local energy companies are committed to the EU's objectives to increased deployment of renewable energy sources (RES). While many companies offer services around the deployment and operation of individual RES heating solutions like solar thermal installation and geothermal energy on customer premises, companies invest in larger scale plants to be integrated in existing infrastructures. In Austria, many larger biomass and solar thermal installations are feeding heat into the district heating networks. In Munich, the district heating network is intended to run on geothermal heat to a large degree by 2040.

With growing maturity of these renewable technologies suitable for heating and cooling, deployment rates are raising, however, especially for individual solutions often barriers such as building

[6] Eurogas, 2015, Position Paper

regulations and a lack of trained experts persist and need to be addressed to stimulate further uptake.

Linking sectors and increasing the deployment of renewable sources

According to the forecasts by Member States in their NREAPs, by 2020, the share of renewable energy in the heating and cooling sector will have reached almost 21%.[7]

In order to build a future-proof energy system that is more sustainable while reliable and affordable to consumers, effective linkages between different infrastructures, i.e. for heat, gas and electricity offer great potentials. As operators of these infrastructures, local energy companies with their specific expertise and knowledge of the local prerequisites, are best placed to develop effective solutions that are becoming increasingly important with rising shares of variable RES supply.

The convergence and efficient links of infrastructure is also crucial for the integration of renewables not only on the heating but also in the electricity and transport sectors. The existing gas and district heating/cooling networks and their storages for example can contribute to efficiently integrate variable RES through power-to-gas or power-to-heat technologies, while decreasing GHG emissions. During times of high electricity production from sun and wind but low demand, electricity, transformed into biomethan or hydrogen can be fed into natural gas networks later re-transformed into electricity or used as other energy carriers for i.e. transport. Thüga, a service company owned by several local energy companies in Germany is currently testing a power-to-gas installation for its capabilities and efficiency. Besides for heating purposes, the produced gas by can also be re-used as fuel for vehicles and replace oil demand in the transport sector or be re-used to produce electricity at a later stage. While electricity storage in the forms of batteries is still rather expensive, using the heat and gas storages can potentially be an efficient means to make the best use of surplus electricity and help to balance the system. Similarly, at times of low production and high electricity demand, electricity can be produced in CHP plants.

The evolution of networks to becoming smarter through ICT and increased automation at consumer premises, will facilitate the effective linking of infrastructures. Smart networks enabling demand-response by consumers, together with enhanced forecasting system for renewable energy production will enable a system that can react flexibly to the circumstances while providing reliable and services to consumers without prejudice to comfort but at a higher degree of sustainability than today.

[7] European Commission, 2015, Issue Paper III – Heating and cooling technologies

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Policy Recommendations for an EU heating and cooling strategy

- Develop a clear pathway for low-carbon heating & cooling in order to attain the 2050 low-carbon goals (from fossil dominated heating sector towards more efficiency and renewable heating and cooling sources), enabling investments through predictability and transparency;
- Take a holistic, infrastructure-based approach placing the local dimension of heating and cooling sector in the focus, leaving flexibility for the optimal solutions;
- Leave as much technology-neutrality as possible within the wider EU objectives for cost-efficiency and innovation-friendliness;
- Provide information and incentives for consumers to replace existing heating and cooling systems – the cheapest and fastest way to save primary energy and carbon emissions;
- District heating is an energy efficient solution and key to further promote RES and should therefore be recognized at the same level as RES in buildings;
- Heating networks have a huge potential for urban agglomerations and need to be sustained. The convergence of systems should be supported;
- In view of the considerable gas infrastructure in place and the projected increases in biogas production, the "greening" of gas should be promoted with favorable legislative frameworks and research and development on the integration of biogas into networks;
- Analyse the links between heating and cooling and the entire energy system, in particular with the electricity sector. Drivers and barriers to the integration of these sectors e.g. via CHP or power-to-heat or thermal storage need to be identified;
- Acknowledge financing role of public banks in de-risking projects and providing support. The smart combination of public and private funding sources can significantly increase the impact and amount of investments in the efficiency of the heating/cooling sector and deliver meaningful emissions reductions whilst also delivering co-benefits such as job creation, health benefits, energy security etc., therefore making worthy use of public money;
- Create a framework to enable Member States to efficiently support the modernisation of the heating and cooling sectors. Tenders, as currently foreseen in the state aid guidelines could effectively make an efficient and new approach to GHG emission reductions impossible;
- R&D is essential: Technology development and demonstration need to be reinforced: today heating and cooling technologies are under-represented in EU funding schemes;
  Research priorities should be:
  - Assessment of existing and possible ways to converge systems: electricity, gas and heat;
  - Next generation (lower temperature) district heating networks;
  - Integration of RES in heat networks.

Next steps

In CEDEC's view, no additional legislation in the field of heating and cooling is needed. The sensible implementation of existing provisions of the Energy Efficiency Directive, the Energy Labeling Directive, the Energy Performance of Buildings Directive and the Renewable Energy Directive have set the framework for a future-proof heating and cooling sector.

However, in the upcoming review of these directives, a strengthened focus on primary energy savings should be taken, ensuring that measures on the supply- and demand-side are equally considered and in the case off trade-off carefully weighed against each other.

In light of the evolution of the Emission Trading Schemes, strategies concerning the exposure of the entire heating and cooling sector to equivalent carbon price signals need to be elaborated. Currently, certain heat producing plants are covered by the schemes, whereas individual solutions such as gas boilers are not covered. A level-playing field should be established, providing incentives to reduce GHG emissions in the sector.

Finally, the heating and cooling strategy should seek to promote improved air quality by calling for heat production installations of all sizes to be covered by appropriate legislation on pollutant emissions.

Who is CEDEC?

CEDEC represents the interests of more than 1500 local and regional energy companies – mostly having local and regional authorities as their shareholders – serving 85 million electricity and gas customers and connections, with a total annual turnover of €120 billion.

These predominantly small- and medium-sized local and regional energy companies are active as:

- Electricity and heat generators,
- Electricity, gas and heat distribution grid & metering operators,
- Energy (services) suppliers.

By investing in local infrastructures, they make a significant contribution to local and regional sustainable economic development. Local and regional energy companies provide services which are reliable, sustainable and close to the consumer.