

EUROPEAN HEATING AND COOLING STRATEGY – FORTUM VIEW

Fortum has extensive experience in producing, distributing and selling district heat (DH) based on a number of technologies i.e. high-efficient combined heat and power (CHP) and heat pumps. We operate in different legal and operational frameworks for district heating where some of them are market- and voluntary based and some are heavily steered by regulation. The long-term societal outputs in terms of fuel flexibility, sustainability and affordability are often clearly better when DH is competing with alternatives based on free choice of customers.

Heat markets in Europe have basically been developed based on either commercial or regulator driven approaches, and are today typically a mix of commercial and regulated solutions. In some Nordic countries heat markets are today contestable. This paper builds on those experiences and provides Fortum's views on to the preparations for the European Heating and Cooling Strategy.

Heating and cooling represent almost half of the total energy consumption in the EU and provides a large potential for energy efficiency improvements. Fortum believes that the EU's Heating and Cooling Strategy should be built on the following key principles that would promote the sustainable heating and cooling markets in Europe:

- 1. Customers: Encouraging the customer (building owner) choice on heating/cooling solutions** – customers should be able to decide their heating and cooling method, affect their consumption and thereby their heating/cooling costs. Customer choice would enforce competition, which would allow customers to keep their total heating/cooling cost on an affordable level and bring higher customer engagement and satisfaction.
- 2. Competition: Ensuring fair competition between the different heating/cooling solutions** – heating/cooling markets can be defined as platform where alternative solutions compete against each other based on their commercial and sustainability merits. When it comes to district heating/cooling this means that one responsible system operator procures heating/cooling from the most competitive sources based on commercial agreements and provides that to customers.

To take these goals forward, the EU strategy on heating and cooling should be based on the following elements:

- 1. Description of the current heating and cooling markets**, actors and alternatives therein as the starting points vary greatly between the Member States;
- 2. Setting up a target market model for heating and cooling** that takes into account the overall energy and climate policy targets of the EU;
- 3. Assessment of the current EU policies and legislation** vis-a-vis the target market model and vis-à-vis the efficiency of implementation;
- 4. Designing specific, dedicated measures** needed to achieve the target market model, including a time line;

5. **Defining supportive measures** like improving awareness, knowledge, data and statistics on heating and cooling, boosting R&D, enhancement of public and private financing and EU level co-ordination towards more competitive heating and cooling markets.

ANNEX I: EUROPEAN HEATING AND COOLING STRATEGY – A MORE DETAILED DESCRIPTION OF THE FORTUM VIEW

A. INTRODUCTION

This paper is intended to contribute to the preparations for a strategy for the heating and cooling in the European energy transition. Developing an EU Heating and Cooling Strategy is, for many reasons, a welcome and timely initiative: Heating and cooling represent almost half of the total energy consumption in the EU. In addition to its size, it has large potential for primary energy efficiency improvements, in terms of both final consumption and system efficiencies. Rapidly developing technologies are introduced at a varying pace in different member states, depending largely on societal and customer expectations and on the flexibility and business orientation of the sector as a whole. These are, to a large extent, defined by the legislative framework within which the heating and cooling companies operate. Furthermore, natural gas is most commonly used directly as a fuel to provide heating for individual houses, underlining both sustainability and security of supply concerns.

A framework strategy for the Energy Union was adopted by the European Commission on 25 February 2015. The forthcoming heating and cooling strategy is linked to the overall goals of the EU energy and climate policies on which the Energy Union approach is also based:

- **Competitiveness** – enhancing competitive and customer-driven heating and cooling markets, which effectively enable new technologies and solutions to emerge, and which would secure affordable and high-quality heating, cooling and energy savings services for citizens.
- **Security of supply** – accelerating the use of local and renewable fuels, as well as steering towards a circular economy by enabling and promoting the thermal energy recovery from non-recyclable waste.
- **Sustainability** – enhancing the efforts for emissions reductions as well as for primary energy savings, seen from a system perspective, and promoting resource-efficient heating and cooling solutions, such as DHC and CHP, utilization of industrial surplus heat, heat pumps and solar thermal.

The focus in this paper is on the space heating markets and on district heating as Fortum has the most experience in district heating and CHP operations in Northern and Eastern Europe (Finland, Sweden, the Baltic countries, Poland and Russia). This does not mean that cooling, industrial heat markets or other heating and cooling

technologies are unimportant; in fact, one of our key messages is to promote open and fair competition between the different heating and cooling alternatives.

The potential contribution of efficient district heating and cooling (DHC), and CHP to EU climate policy goals in the context of a heating and cooling strategy is described in Annex II.

B. A WELL-DESIGNED AND WORKABLE HEATING AND COOLING STRATEGY

The main drivers affecting the heating and cooling in the coming years are meeting climate targets, improving the energy efficiency of buildings, tougher competition through emerging new technologies and higher customer requirements and engagement on energy efficiency and sustainability. The EU Heating and Cooling Strategy should, therefore, highlight the following key principles:

- **The importance of customers' (building owners') freedom to choose between heating and cooling alternatives.** The future role of the users and decision makers who need the heating and cooling services, i.e. the end customers should be enhanced. In some member states, the role and engagement of customers is substituted or even replaced by regulators. This eliminates competition and tends to lead to overall inefficiency associated with higher costs and, from the customer perspective, a sense of detachment.
- Instead, **heating and cooling markets should be developed based on effective competition between different alternatives** like DHC and solutions for individual buildings like electricity, gas, heat pumps, etc. Competitive and customer-driven heating and cooling markets would best be responding to above mentioned drivers. A transformation of the heating sector towards market-based and business-driven operations instead of heavy-handed regulatory steering offers great potential for improving the efficiency of heat consumption, supply, distribution and production, while keeping the end-user costs of heating at an affordable level.

In competitive heating and cooling markets policies and regulations incentivise action towards wanted targets or to fix market failures, i.e. lack of sustainability, investments or efficiency, and/or to protect customers against monopolistic market positions. However, in regulated systems the focus tends to be in short-term targets like keeping the unit prices of heat low (sometimes even artificially low) and on sheltering customers (whether vulnerable or not) from external changes in the business environment, i.e. spikes in fossil fuel and environmental costs, and thereby taking a social policy role.

Therefore, transforming highly regulated heating sectors into competitive markets might, on the one hand, increase the unit prices of heat in the short term due to new investments and better cost-reflectivity, but, on the other hand, would require operators to make sure that their solutions become competitive and affordable through improved efficiency and sustainability. Furthermore, our experience has shown that

increased incentives for efficiency triggered by higher unit prices more than annuls this effect, and thus leads to lower total heating costs. In other words, the overall outcome would be better customer value and higher efficiency at the similar or lower costs.

It is nevertheless important to acknowledge the key heating and cooling market characteristics:

- **Heating and cooling are local activities with direct interaction with end customers.** The access that end customers have to different heating alternatives determines the relevant heat market and sets the field for competition. Some heating methods, e.g., electricity and gas, have national or even international markets, but the competition in heating and cooling is, nevertheless, local.
- **Many heating and cooling solutions are long-lasting and require heavy up-front capital expenditures similarly to other energy infrastructures.** Providing competitive products compared to individual heating and cooling solutions would require a holistic approach to assess the societal and system benefits.
- **Effective competition mechanisms in heating and cooling are different to electricity and gas retail** because heating typically requires relatively high up-front investment made by the end-customer (building) in addition to infrastructure. Therefore the switching rationale (both technical and economic) and costs may differ much between heating and cooling alternatives from end-customer perspective.
- **Cooling is a relatively new but rapidly developing market¹.** Therefore, its importance from the primary energy angle may not be that huge but it is certainly increasing. Electricity usage for cooling is embedded in the total electricity consumption of buildings, which is divided among several electricity-consuming devices. The total cooling demand has been estimated at 1,400 TWh assuming that all buildings require cooling.

C. KEY BUILDING-BLOCKS OF THE EU HEATING AND COOLING STRATEGY

1. Description of the current heating and cooling markets

Operating frameworks for heating and cooling, being local activities, differ greatly between the Member States. Some have developed fairly competitive markets, while others have heavily regulated frameworks in place. Therefore, it is important to

¹ Ecoheatcool initiative. Work package 2. The European Cold Market. Final report. December 2006.

describe the current status in different Member States in terms of legislative and operational frameworks.

The description could include, inter alia, the following items:

- Total space and industrial heating/cooling markets
- Heating and cooling demand scenarios by 2030 and by 2050
- Breakdown of space heating/cooling markets between various solutions and fuels
- Structure of space heating by customer segments and industrial heating by industry sectors
- Main actors involved, i.e. private and public ownerships, number of utilities, role of authorities (regulators, competition authorities), etc.
- Description of the involvement of customers
- Overview of relevant, sector-specific legislation and regulation both on EU and national levels

2. Setting up a target heating and cooling market model that takes into account the overall energy and climate policy targets of the EU

It would be important to define the target market model for heating and cooling towards which all member states would be encouraged to start moving. Heating and cooling would deserve to be developed as commercial businesses, rather than regulated public services. When doing that the following key principles should be taken into account:

- ***Enhancing the role of heating and cooling customers (building owners).*** Improving the role of customers is probably the most important aspect that the EU Heating and Cooling Strategy should promote. Free customer choice is the main enabler for effective competition as well as increased customer engagement and trust.
- ***Competition built on commercial merits of heating and cooling solutions, not on regulation.*** Fair competition between alternatives would result in competitive and affordable energy supply. In such markets efficient and commercially motivated actors are rewarded by the opportunity to receive revenues for successful operations that correspond to business risk.
- ***System boundaries matter.*** When applying fiscal and legal instruments to heating and cooling, it is important to recognise the different system boundaries of different heating/cooling methods. Individual heating and cooling covers only the house in question, district heating can be city-wide, while electricity is increasingly based on a European market. This is particularly challenging, as all interventions generally should be based on technology neutrality. For example when defining the energy performance of buildings results would vary greatly if it was measured as the netted use of primary energy or as the energy purchased by a building.

- ***Competition means equal treatment of different heating and cooling solutions.*** Examples of different legislative and regulatory treatment are numerous: For example, some heating and cooling methods are covered by EU ETS, some by national CO₂ taxes, and some are subject to both. Renewable electricity is often subject to subsidies, whereas renewable heat is not. Some heating methods are regulated (like district heating in many member states), while some are not.
- ***Competition promotes new emerging technologies.*** A competitive market is the best tool to advance new technologies, innovative business models, and overall resource and system efficiency.
- ***The single DH system operator model should be legally required to guarantee DH competitiveness.*** To be able to compete against other heating solutions, DH should be managed by one operator responsible for its competitiveness against other solutions. Single system operator model would also enable efficient use of other heat sources, as the operator would have an incentive to procure heat from the cheapest sources (incl. industry waste heat) in order to remain competitive.

3. Assessment of the current EU policies and legislation vis-a-vis the target market model

It would be important and necessary to assess and ensure that the existing EU-level legislation affecting (either directly or indirectly) the heating and cooling sectors supports the development towards the target market model. Such legislation covers directives on the energy performance of buildings, on renewable energy, on energy efficiency, on emissions trading, and on waste management, to mention a few.

The focus should be set on primary energy savings and on rewards for efficient use of energy in the entire supply chain of heating and cooling (production, distribution and supply), as well as on consumption. Policies on building performance should promote an optimal balance between renovation investments and providing a more sustainable supply. The member states' interpretation and implementation of the EED will play a key role here as well.

4. Designing specific measures to achieve the target market model, including a time line

It may well be that after the assessment of existing legislation some additional measures – either in the form of new legislation or revising or repealing some existing pieces of legislation – will be needed in order to achieve the defined target market model. This means that a realistic time line with adequate follow-up and monitoring would be needed in the implementation of the necessary measures. Given the very different starting points, the path towards the target market model (and especially its length) can vary considerably between the Member States. It might also be worthwhile to consider targets for heating and cooling, e.g. on the use of DHC and CHP.

5. Defining supportive measures

In order to raise the awareness, transparency and profile of the heating and cooling sectors, the improvement of sector data and statistics is a necessity. Statistics on heating and cooling in the EU are underdeveloped, mainly due to the lack of a clear definition of the sectors. In addition to the past (statistics), evolution of the heating and cooling sectors towards 2030 and 2050 should be established.

The R&D effort in energy in general and in heating and cooling in particular has not been sufficient in the EU. The development of heating and cooling technologies has recently spurred through competitive pressure. The key in R&D is to apply a wide perspective; research related to heating and cooling should be seen in the context of sustainable living with a special focus on growing urbanisation and welfare of citizens. Such R&D should cover new and existing buildings and urban infrastructure, and it should consider different scales (individual buildings vs. larger city-wide scopes.), forms of energy (heat, cooling, gas, electricity etc.) and technologies (CHP, solar, heat pumps etc.).

While the substantial part of district heating and cooling is today owned and operated by public stakeholders and while the expected investment requirements are significant, the enhancement of both public and private financing shall be critical for the deployment of new technologies and infrastructure. It shall be likely that the role of private involvement and financing should respectively be promoted.

It would be worthwhile to consider how to enhance EU level co-ordination related to legislation and regulation of heating and cooling sectors similarly to electricity and gas markets where ACER is having such a role. Currently only a very limited number of widely acknowledged analysis or recommendations on the best practices regarding heating and cooling sectors exist. Such analysis could cover i.e. how to organize the ownership of housing sectors and to enhance the equal and fair competition between various heating solutions.

In addition to new technologies, the future business models also should be addressed. For example, as in the electricity sector, smart DH networks are being developed in some member states, encouraging customers with excess heat to become prosumers who buy heat when needed and sell their excess heat back to the DH network at pre-agreed technical and economic conditions. A smart DH network also offers a market-oriented way to incentivise the use of waste heat and optimise the heat networks without regulatory obligations. It is to be noted, however, that smart DH network does not mean a third party access in a sense that anyone with excess heat can push that into the network and the operator must receive it and pay for it. On the contrary, it means that the DH operator procures heat from the cheapest sources based on commercial agreements and provides that to customer. At the same time, this single system operator is in charge of the competitiveness of DH compared to other heating solutions.

For additional information, please contact:

Harri-Pekka Korhonen	Head of Heat Policies and Regulation, Fortum Corporation	harri.korhonen@fortum.com +358 50 452 9321
Monika Kuusela	Senior Manager, Heat Policies and Regulation, Fortum Corporation	monika.kuusela@fortum.com +358 40 822 7054

23rd June 2015

ANNEX II: CONTRIBUTION OF EFFICIENT DISTRICT HEATING AND COOLING AND COMBINED HEAT AND POWER TO CLIMATE CHANGE MITIGATION WITHIN THE HEATING AND COOLING STRATEGY

Today, district heating has about a 12% share in European space heating markets² and CHP has about an 11% share in European electricity markets³. At the EU level, the heating sources with the highest market shares are direct gas, oil and wood heating, and electrical heating. District heating, in turn, is the main urban heating method in several Northern and Central European Member States, and has market shares of 40% or more.

The EU Energy Efficiency Directive (EED) calls for assessments of the national potential for efficient district heating and cooling, and for highly efficient CHP, which can achieve 10-25% savings in primary energy compared to separate production of heat and electricity. The national implementation of the EED is currently ongoing, and the required assessments should be completed by the end of 2015.

We would like to underline the relevance of promoting various sustainable heating and cooling solutions, such as district heating, heat pumps, efficient gas- or pellet-fired individual boilers, solar panels and chillers, to fully cover the market for heating and cooling. DHC should be seen as one resource-efficient heating and cooling method competing against these other solutions. Effective and sufficient competition will incentivise DHC operators to continuously strive for increased efficiency and competitiveness. Regulatory measures that force actors inside the DHC value chain to compete against each other for the retail or production sub-markets are, in this regard, counter-productive; all such market regulations have failed to deliver market-based customer prices or efficient and sustainable production solutions.

A. Resource efficient district heating and cooling

DHC's value to society and customers should be acknowledged in the Heating and Cooling Strategy as follows:

a. Competitiveness

- **Simplicity for end customers in order to enhance trust and commitment.**
The responsibility (reliability and service quality) for heating and/or cooling supply is transferred to the suppliers, and, as the operation of the production units are mainly automated, customers do not need to perform any actions.
- DHC solutions utilise local and often renewable fuels (biomass, non-recyclable waste, geothermal, solar) and recovered heat sources (CHP,

² Heat Roadmap Europe 2050. Prepared by several institutions for Euroheat & Power in 2013.

³ Intelligence Energy Europe: CODE 2 project. January 2015.

22nd April 2015

industrial waste heat), and are thus characterised by **high fuel efficiency, availability and reliability**.

- **Economically viable** DHC systems based on competitive pricing in deregulated markets are profitable in accordance with their riskiness and do not require specific subsidies.

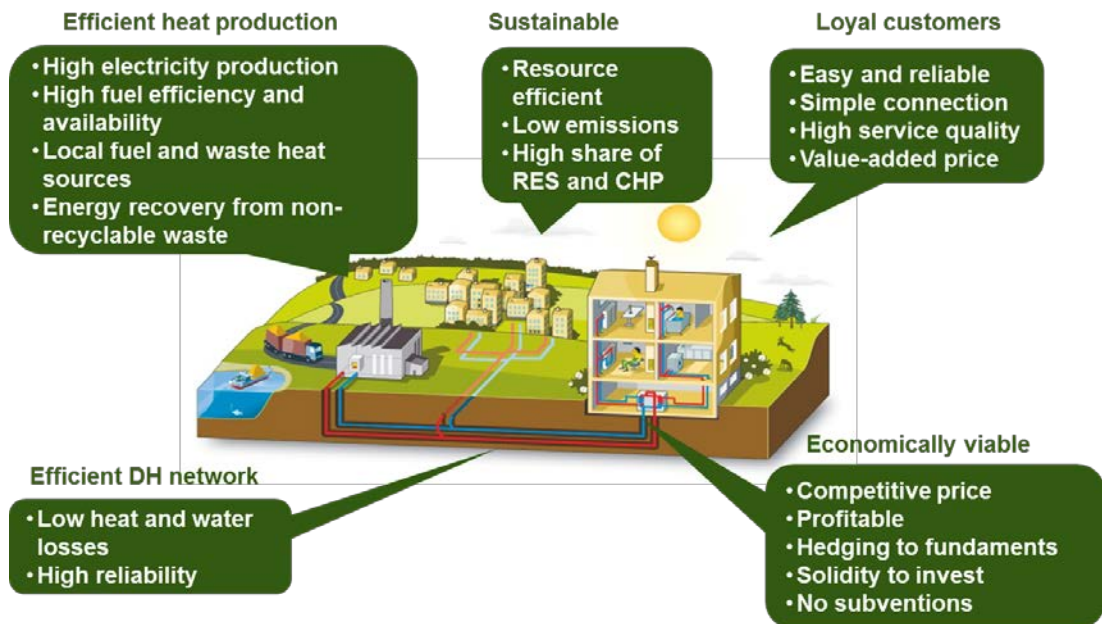


Figure. Resource efficient DH system

b. Security of energy supply. Being well-suited to use indigenous local fuels, CHP directly contributes, and can contribute even more, to the realisation of the EU's security of supply targets. Furthermore, the efficiency gains of a competitive heating and cooling markets will lead to lower consumption of both end use and fuels, which will also contribute to increased security of supply.

c. Sustainability. The sustainability features of DHC solutions will be evident when applying a system perspective, in line with the intentions stated in the EED, that clearly calls for reduced primary energy usage.

DHC solutions have:

- a strong local aspect (use of local fuels),
- a regional aspect (less emissions than from numerous small individual sources), and
- a global aspect (good carbon performance and high production efficiency).

22nd April 2015

In addition, open and smart district heating networks offer a market-based incentive to use waste heat from different sources. This further improves the overall energy efficiency of district heating.

B. High-efficient combined heat and power

CHP⁴ is the simultaneous production of electricity and heat, both of which are used. The central and most fundamental principle of cogeneration is that systems are based on the heat demand. This can be an individual building, an industrial factory or a town/city served by district heat/cooling. Through the utilisation of the heat, the efficiency of a cogeneration plant can reach 90% or more.

There are wide differences between Member States, with varied shares of cogeneration ranging from 0% to 47%. Latvia has the greatest share of cogeneration in total electricity generation (47.4%) followed by Denmark. Significant potential exists in new EU Member States, particularly for refurbishing district heating schemes and upgrading them to include modern cogeneration where previously only heat was produced. This is universally the case where a large district heating infrastructure already exists.

CHP-based electricity production can be roughly split into two segments: ½ coming from DH connected CHP and ½ coming from industrial CHP. CHP plants generate almost ¾ of the thermal energy needed in district heating and cooling networks. The growth potential in DHC in urban areas is significant, creating subsequent economic and technical potential for CHP. In less dense areas, micro-CHP could offer ideal low-carbon and energy-efficient solutions.

Highly efficient CHP is well suited for DHC. CHP can effectively use renewable and CO₂-free biomass and non-recyclable waste in addition to other indigenous fuels. It also can address the electricity generation adequacy issue countries are facing today and help to achieve the transition towards a more sustainable energy system.

CHP-integrated energy concepts supporting energy efficiency and sustainability – the case of fast pyrolysis

It is well known that a conventional CHP plant as such is a highly energy efficient way of converting fuel into heat, steam and electricity. However, by integrating this system with another process, e.g. fast pyrolysis bio oil production (for replacing fossil fuel oils) in such a way that the otherwise surplus energy and by-product flows can be fully utilised for the benefit of the total combination, the overall efficiency of the plant becomes superior compared to stand-alone processes. CHP-integrated energy concepts also benefit from high resource efficiency, since several products can be produced from the same feedstock and no raw materials or heat are wasted. Consequently, the CO₂ efficiency of the “three-generation” plant becomes extremely competitive, especially in cases where all the used fuels and raw materials are sustainably produced renewables.

⁴ Source: www.cogeneurope.eu