

FOCUS ON DISTRICT HEATING AND COOLING

EDITO



Julije Domac

We live in exciting times. “Build-back-better” became the universal slogan in times of COVID-19 crisis and recovery. It seems that we have finally realised that we are fragile, that we do not control nature and that climate change is a real threat. More than ever before, we know that the European district heating sector could be one of the most important contributors to the Green Deal transition.

Supplying, on the one hand, a significant amount of the heating services in northern and western parts of the EU (approximately 50% in Denmark and Finland), district heating is a mature technology. On the other hand, in most Central and Eastern Member States, district heating is facing severe challenges such as an old and inefficient infrastructure and a loss of consumers due to the unreliability of supply over the last decades. Yet, there is a wide consensus: district heating is one of the most promising options to decarbonise the heating sector and cities in general, and is therefore crucial to reach European and global climate goals.

How are we going to do this? The local context is always a challenge for district heating and there are no ready copy-paste solutions. The good news is that funding is not the issue, as there is no lack of funding for good projects with strong impacts. We have a very interesting and dynamic financing period in front of us, we just need to use it.

The district heating sector offer options for great innovations. Solar energy, biomass, geothermal, cogeneration, waste heat from industry, smart and digital solutions and so much more... Buildings need heating and cooling, and this is unlikely to change. Therefore, the future lies in supplying heat and cooling energy to low-energy buildings, with low losses and high energy efficiency. The heating sector and district heating in particular will be a catalyst for new business models such as waste heat utilisation or heat prosumers. It can help drive the stronger uptake of renewable electricity through demand-side measures and sector coupling.

Decarbonisation of the European district heating is not a goal in itself. Together with innovation, it will drive the competitiveness of our industry; it will reduce our reliance on fossil fuels thus increasing our security of supply; and it will help improve air quality both indoors and outdoors, protecting our health. If the EU wants to decarbonise, our cities need to decarbonise first and district heating is a key piece of this puzzle.

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With a longstanding experience in the energy sector and in the Directorate General for Energy of the European Commission, Paula Abreu Marques has been until recently the head of unit responsible for the definition and implementation of the EU renewables' policy. Since January 2021 she is heading the unit in charge of the overall coordination of the energy policy, interinstitutional relations and the outreach to Member States.

Eva Hoos is a policy officer working on EU heating and cooling policies since 2009 first in the energy efficiency unit and from the end of 2016 in the renewable energy unit of Directorate General for Energy of the European Commission. She is part of the team responsible for updating the recast Renewable Energy Directive to align it with the Green Deal and the Climate Target Plan.

Europe is in a period of extraordinary efforts. The EU is putting in place the European Green Deal, a strategy to make Europe climate neutral by 2050, simultaneously with the Economic Recovery Plan to restart economic growth after the COVID crisis. These initiatives provide the foundation for a green and digital recovery. Increased deployment of renewable energy plays an important role in transitioning to a resilient carbon neutral economy in a cost-effective way.

Heating and cooling in the EU Energy System

In the last decade, we have seen an important and steady increase in renewable energy in our energy system. Today, **more than a third of electricity we consume comes from renewables**. Renewable constitutes the largest part of new investment in power generation today and they are projected to reach above 80% market share by mid-century. Unfortunately, similar breakthrough did not take place in the heating and cooling sector.

Heating and cooling drives half of the energy consumption in Europe. However, more than two thirds of demand is met with fossil fuels and only around one fifth comes from renewables. Changing the conventional fossil paradigm in heating and cooling **is essential for reaching the EU decarbonisation goals**.

The challenges

Heat **cannot be transported over long distances** and heat needs are specific to each user. Heating systems are local with their own particular geographical, technical and other conditions. Successful heat decarbonisation strategies should embrace these **specific circumstances**, while EU policies can provide overarching frameworks for common elements.

Most heating takes place in cities and buildings (~ 60%). Cities have limited space and often renewables are brought in from surrounding areas. That is why district heating and urban planning can play an

important role in heat decarbonisation in cities.

Integrated urban planning, coordination and cooperation

Modern renewable based efficient **district heating can operate on multiple energy sources and heat generation technologies**, thus capable of collecting and distributing renewables and other carbon-neutral sources from a wider area. By combining these sources, they can satisfy the full demand of buildings with clean energy. However, for these systems to develop they need a sufficient **expansion of efficient, low-temperature buildings**. Investment in the decarbonisation of heat supply must be closely coordinated with refurbishment programs and infrastructure development.

The first step in decarbonising heat is **energy planning and heat mapping**. Municipalities should assess the evolution of heat demand within their territories and the renewable energy sources available cost-effectively in sufficient quantities. They also need to assess infrastructure needs to transport those sources to consumers.

Infrastructure developments depend very much on **urban planning** and municipalities play important roles in developing energy infrastructures as owners, regulators, or facilitators. Coordination of renewable heat supply and infrastructure with **building refurbishment or construction plans** is essential. Good **coordination across the many actors** at national, regional and local levels, and between municipalities, utilities, citizens, professional bodies is key for successful heat decarbonisation. Municipalities are at the center of local coordination to bring together all these actors.

The way forward

The **Climate Target Plan** increased the EU 2030 CO2 reduction target to 55%. This makes it necessary to review the targets and measures in the **Renewable Energy Directive** and the **Energy Efficiency Directive**.



ABOUT FEDARENE

EUROPEAN FEDERATION OF AGENCIES AND REGIONS FOR ENERGY AND THE ENVIRONMENT



FEDARENE is the premier European network of agencies and regions at regional and local levels. It was established in 1990 to represent and promote the local and regional dimensions to the European institutions. FEDARENE organises exchanges of experience and partnerships between its members. It now has more than 80 members in 23 countries in the European Union.

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Similar reviews are required for other relevant legislation, e.g. the Energy Performance of Buildings Directive, the EU ecodesign and energy labelling state-aid and energy taxation.

The 2021-2027 EU multiannual budget and the Resilience and Recovery Plan foresee substantial increase in clean energy investment. The Renovation Wave calls for the doubling of building renovation rate and the replacement of 4% of heating equipment annually. The EU Energy System Integration strategy prioritises renewable electricity use in all end-use sectors and the development of modern district heating and cooling systems.

The new wave of green investment fostered by the European Green Deal and the Recovery and Resilience Plan give hope that this decade will experience a similar expansion of competitive heating and cooling technologies and modern district systems that the previous decade witnessed in the electricity sector. This would reinforce EU renewable leadership and ensure continued well-being for its citizens.

The information and views set out in this article are those of the authors and do not necessarily reflect the official opinion of the European Commission.

ENERGY IMPROVEMENT DISTRICTS IN THE BASQUE COUNTRY

District Heating (DH) systems are one of the most energy-efficient heating systems in urban environments, with proven reliability. When combined with renewable and waste heat sources, DH becomes an even higher efficient solution to decarbonise heating. It also guarantees competitive energy costs with limited influence of fossil fuel supply price volatility. To achieve this, a transition is needed in DHs, comprising not only measures to improve overall performance (temperature level reductions, improvement of substations, etc.), but to guarantee system viability as a whole in a context of reduced heat loads with the transition to Nearly Zero Energy Buildings (NZEB).

RELaTED deploys a decentralised, Ultra-Low Temperature (ULT) DH network concept, which allows for the incorporation of low-grade heat sources, larger shares of Renewable Energy Sources (RES) and distributed heat sources. In RElAtED, every single building is converted into an energy node, where bi-directional heat exchange is allowed between the network and the building, with the introduction of heat pumps as heat generation systems. This way, operational costs are reduced due to fewer heat losses, better energy performance of heat generation plants, and extensive use of decarbonised energy sources at low marginal costs.

One of the pilots of the project is located in Iurreta, in the Basque Country (Spain). The demonstration site consists on a corporate district heating network in buildings owned by the Basque Government, which will be connected to a ULT DH, including the installation of heat pumps in each of them.



Ente Vasco de la Energía (EVE), the Basque Country energy agency, believes this pilot will demonstrate the feasibility of DH, even in southern Europe. They have thus performed a study at the regional level in Basque Country to identify industrial waste heat sources suitable of heat recovery and they have matched this available resource with candidate urban areas suitable for ULT DH systems, considering their heat energy demand and the cost of setting up heat delivery infrastructure. The work will allow them to define three feasibility studies with the more promising sites in urban areas of the region to analyse the opportunities of this technology. They expect that the results obtained will showcase the viability of the technology and an opportunity to develop it in the Basque Country.

RELATED: RENEWABLE LOW TEMPERATURE DISTRICT

Since 2017, the RElAtED project has progressed in the development of its ULT DH concept by testing new technologies and running its four demonstration sites (Iurreta - Spain, Tartu - Estonia, Belgrade - Serbia, and Vinge - Denmark). The work carried out shows that substantial efficiency and environmental benefits can be reached with the use of much lower temperatures.

Usual DHs are designed and operated to distribute heat at about 80 °C to consumers. However, RElAtED aims to successfully implement service temperature levels as low as 40-50 °C. This leads to many opportunities and challenges for both consumers and producers.

One of the big challenges is managing and optimizing ULT DH networks with high energy flexibility. Another key issue was the economic feasibility of the conversion from classic DH to ULT DH systems. The Energy Price Assessment carried out by the project reviews different heat production technologies and

their associated fuels to evaluate their cost/benefit ratio in the medium and long-term. The study considered the specificities and constraints of each demonstration sites which can affect the price volatility of energy. The Vinge pilot illustrates and details a guide on how low-temperature concepts can be applied in new district heating developments.

The high potential for mixed sources of energy is essential to understand the aim of RElAtED. Project partners are currently working on several developments - the incorporation of technologies like DH substation, heat pump, and solar thermal systems. The ambitions of RElAtED are high and the results published so far show that the project is on the right pipe!

For more information, visit the website: relatedproject.eu



ENERGIKONTOR SYDOST INTRODUCES BIOENERGY RETROFITTING IN SWEDISH LOCAL COMPANY FOR DISTRICT HEATING GRID



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Retrofitting is one of the fastest ways to increase Europe's renewable energy share by making the energy production of existing industries more sustainable. Compared to new 'greenfield' installations, retrofitting offers lower capital costs, faster implementation and less production time losses.

Thanks to the EU-funded project BIOFIT, the Regional Energy Agency of Southeast Sweden was able to analyse the potential feed-stock conversion of two back-up boilers at Swedish district heating company "Sölvesborg Energi och vatten". The objective is to investigate the possibilities and prerequisites for moving from fossil oil to light or heavy bio-oil in the existing boilers. Carried out in collaboration with

partners in the consortium, the analysis indicates a short pay-back time, in addition to less carbon emissions.

Sölvesborg Energi och vatten purchases waste heat from a nearby pulp and paper mill where a large heat exchanger is located and from where the heat is pumped onto the city of Sölvesborg for deliveries to their district heating clients. The case concerns the back-up and peak-load boilers Sölvesborg Energi has to secure for heat deliveries to their clients.

Thanks to the study, the company has received the assessments of experts on supply chain, techno-economy, and environment. Discussions on risks and barriers identified also widen the company's understanding to decide on a possible investment for the retrofit. Although the Company identified some barriers, like the availability of renewable fuel and taxation of the bio-oil, the assessments show promising results like short pay-back times and positive climate consequences.

Many Swedish district heating providing companies are independent of fossil oil, also for their back-up production. Now it's up to the owners, the municipality of the company Sölvesborg Energi och vatten if they also want to invest for decarbonisation.

More information: www.biofit-h2020.eu

TRANSFORMATION OF DISTRICT HEATING SYSTEMS IN KOROŠKA SAVINJSKA AND ŠALEŠKA REGION



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Through its involvement in numerous EU projects and the largest Slovenian district heating system being located in the region, the energy agency KSENA has acquired a considerable amount of knowledge and experience in DHs renovation and transformation, which it is currently applying in three different operations.

In the H2020 project KeepWarm, KSENA played an important role in preparing a roadmap for the municipal district heating of Velenje – KP Velenje, which will invest around 3.5 million EUR in the modernization of the grid in the next five years. With this investment, primary energy savings are estimated at 1,600 MWh on a yearly basis (40 GWh over 25-year lifespan). Annual CO₂ savings will amount to around 784 t/year (19 600 tons in 25 years).

Another large DH investment is taking place in Slovenj Gradec, where local biomass will become the main energy source for their local district heating system. The DH system currently uses natural gas as the only energy source. With the new biomass boiler, which will cover up to 80 % of the energy needs and drastically increase the share of renewable energy sources to around 10,000 MWh per year. Such an investment would lead to CO₂ savings of 1,600 t/year (40,000 tons in a 25-year life span).

Finally, KSENA is also involved in the Interreg Central Europe project ENTRAIN, which aims at improving the capacities of public authorities to develop and implement local strategies and action plans for enhancing the use of endogenous renewable energy sources in small district heating grids. Implementation of these action plans will lead to a CO₂ emission reduction, to an improvement of local air quality and to socio-economic benefits for local communities. On its territory, KSENA is supporting the quality of operation of several small DH systems running on biomass by providing planning guidelines for biomass and renewable district heating, from the project initiation to the plant commissioning phase. The target group of these guidelines are potential operators and investors of biomass district heating systems.