COOL DH
COOL DISTRICT HEATING

Cool ways of using low-grade Heat Sources from Cooling and Surplus Heat for heating of Energy Efficient Buildings with new Low-Temperature District Heating (LTDH) Solutions.

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Dissemination level:

PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
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Quality control assessment

Issue	Date	Comment	Author
V1.0	19/08/2022	First version sent to reviewers	John Kapetanakis
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Scope of deliverable

This deliverable is presenting policy recommendations concerning low-temperature district heating networks and waste heat recovery. The report is part of the WP9 Task 6.7 Promotion at the European / International level through the association, led by Euroheat & Power.

Context of deliverable

This deliverable summarises the recommendations for policymakers based on the COOL DH project findings and experiences. A webinar linked to this topic is also documented in this report. The conclusion of the report, in the form of recommendations, targets policymakers to facilitate and assess the development of a supportive legislative framework for COOL DH solutions replication.

Perspective of deliverable

The COOL DH policy recommendations are part of the task of promoting the results at European and International level targeting specifically policymakers.

Involved partners

EHP as task leader developed the policy recommendations based on the observations and findings of other COOL DH partners. Furthermore, EHP organised and hosted the webinar, where COWI participated.

English summary

The transition to low-temperature supply in district heating networks , as well as the transition towards renewable heat sources, allow the introduction of new technical solutions for increasing system efficiency, reducing primary energy demand and increasing the share of renewable energy sources e. from solar and heat pumps – as well as allowing new actors in the district heating production.

This document aims to ensure that the project results provide a meaningful contribution to the ongoing policy discussion in the overall energy field and provides recommendations for policymakers on how to promote and maximise the benefits of low-grade district heating as well as facilitating the implementation and removing the barriers hereafter.

Based on experiences concerning the energy policy framework of the involved countries and the EU, the observations made by other EU-funded projects, and including also the input from the dedicated webinar, the COOL DH project summarises a list of energy policy recommendations at the EU level.

COOL DH Policy recommendations

The propositions listed below aim at improving the competitiveness of the district heating and cooling sector, which enables greater efficiency and the integration of renewables, in the EU legislative framework.

The measures recommended also promote the upgrade of waste heat in the EU legislation that would enable its market uptake.

- introduce a carbon tax (e.g. for all new constructions that use fossil-fueled heating) that will include externalities and tally the future damage costs of carbon emissions by a penalty;
- ensure a level playing field for all heat supply technologies, including waste heat recovery solutions;
- define waste heat and treat it evenly with renewables;
- make waste heat recovery standard by obliging all new constructions to utilise excess heat from possible processes;
- allow local non-fossil co-production of heat at the consumer level also in areas where district heating connection is obligatory;
- require a maximum allowable return temperature from consumers to the district heating network.

Contents

Abbreviations

EU	European Union
DH	District Heating
LTDH	Low-Temperature District Heating
EED	Energy Efficiency Directive
RED	Renewable Energy Directive
EU ETS	European Union Emissions Trading System

1. Introduction

The EU-funded project COOL DH innovates, demonstrates, evaluates and disseminates technological solutions needed to exploit and utilise sources of very low-grade waste heat for heating energy-efficient buildings via LTDH and shows how the DH systems can be carried out more energy-efficient and resource-efficient. In the new generation of district heating networks, the lower supply temperature leads to the reduction of the heat losses in the distribution network, reaching higher efficiency of the system. The reduced operative temperatures in the network allow the introduction of new heat systems that take advantage of low-grade heat through heat pumps, such as waste heat from cooling systems. The impact will be high, especially in countries that have a long DH tradition and are frontrunners in development, where the market for replication is expected to be considerable.
The current deliverable is part of the report is part of the 'Task 6.7 Promotion at the European/ International level through the association Euroheat & Power', and refers to the activities EHP has carried out, with the contribution of other COOL DH partners, and are focusing on policy:

1. The Policy Webinar.
   EHP organised a webinar that was dedicated to the discussion of the current and future policy framework was organised on 29 April 2022. The experts invited to speak had the opportunity to outline the direction the policymakers must make steps towards to facilitate the expansion of district energy networks and the uptake of the utilization of low-grade excess heat sources.
2. Meeting with Policymakers.
   For the presentation of COOL DH project results and findings from the implementation at the demo sites, it was chosen to invite and engage EU policymakers and EC officials to project events, such as workshops, webinars and conferences instead of one-to-one meetings. For the promotion of the topics of low-temperature district heating and waste heat higher in the EU policy agenda, EHP, as task leader and as the European association for district heating and cooling, has been in consant dialogue with EU policymakers.
3. The Policy Recommendations.
   In the current report EHP has formulated several recommendations focusing on the role of district heating and the importance of upgrading waste heat in current EU policies (EU Directives).

2. The current legislative framework in COOL DH Countries

During the implementation of the COOL DH project demo sites in Denmark and Sweden, the legislative framework of the two countries concerning the utilisation of waste heat became a topic of study (in the report D6.4 Working paper on the legislative framework). The current chapter draws several information from that report in the form of summary.
The COOL DH project is based on two demo sites, Høje Taastrup in Denmark and Lund in Sweden. The demo site in Denmark is in the Municipality of Høje-Taastrup, where an existing district heating network is being renovated and converted to a low-temperature supply. Lund in Sweden and Høje-Taastrup in Denmark both located in the Öresund region share many similarities but operate on different legislative and energetic frameworks.

2.1 Sweden

The amendment of the district heating law (2014:444) aims to encourage more extensive cooperation between district heating companies and industries. Up until 2014 DH companies in Sweden had no obligation to admit access to their networks. This entailed that the DH companies had a natural monopoly concerning the distribution of heat. Since 2014 the amendment aimed to improve the possibility for an external heat producer to demand a connection, provided that no damage will be

imposed on the DH company. A DH company is obliged to negotiate with a company or industry that wishes to access and connect to the district heating network. With the clause concerning prime quality heat (no booster needed), that cannot be refused by the DH company, the LTDH networks are more beneficial for waste heat owners. However, there are concerns that:

- the district heating company can reap most of the economic benefits.
- all of the investment costs should be paid for by the external heat producer
- a large investment made by the industry to sell their waste heat can go unrewarded

A new law states that a district heating company wanting to expand or rebuild its network must perform a cost and benefit analysis of using waste heat from industries before expanding or rebuilding its activities. The laws with indirect (negative) effect on waste heat utilisation are:

- the ordinance against landfill of combustible waste
- the requirement from the National Board of Housing, Building and Planning to have at least 50°C at the tap

There is no fixed business model on how the investments and earnings should be distributed between the industry selling waste heat and the district heating company. However, there are electricity certificates on low-carbon electricity production by CHP using biomass as fuel. The heating industry is regulated by market forces and reasonable business models. There are no taxes on the production of waste heat, instead, there are tax reductions on electricity use for energy production, which district heating would be considered as. Therefore, if part of the electricity use of an industry can be allocated to the production of waste heat then it might be possible to get a tax reduction on this share. There is also a tax reduction, or refund, for fuel and electricity that is used for heat production for industry, agricultural purposes or greenhouses. This might thus be another suitable use for waste heat.

2.2 Denmark

Regulation of prices of heat supply and relationships with customers means that, although district heating companies have status as non-profit monopolies, they are regulated to protect the individual consumer. The stability of the Heat Supply Act has been very important in the development of large systems, as investments can be made based on long payback times. The objectives of the municipal heat planning are:

- to promote the heating at the lowest socio-economic costs;
- to promote the most environmentally friendly heating form (including promotion of cogeneration of heat and electricity); and
- to reduce energy supply dependency on oil and other fossil fuels.

The high percentage (20%) of heat supplied from waste-to-energy plants is due to a high level of political support for waste-to-energy, together with the extensive district heating networks. It is no longer possible to introduce new obligations for connections to a district heating system if the consumer has a socio-economic better alternative based on using primarily renewable energy. Some suppliers use discounts when connecting. The discounts could be to lower heat costs in the first few years or that the district heating company covers the cost of the branch pipe. New rules for taxes and administration will make it profitable for companies to use their excess heat or sell it to the district heating network.

3. EU Policy framework

With the Fit-for-55 package, the Commission presents the legislative tools to deliver the targets agreed upon in the European Climate Law. The heating and cooling (H&C) sector will be significantly impacted by this legislation and will be required to make a major contribution to the achievement of the decarbonisation target. In particular, the proposals having the biggest impact on DHC, and the wider H&C sector, are the revision of the Energy Efficiency Directive (EED), the revision of the Renewable Energy Directive (RED) and the revision and extension of the EU Emissions Trading System Directive (EU ETS), (Corscadden, et al., 2022).

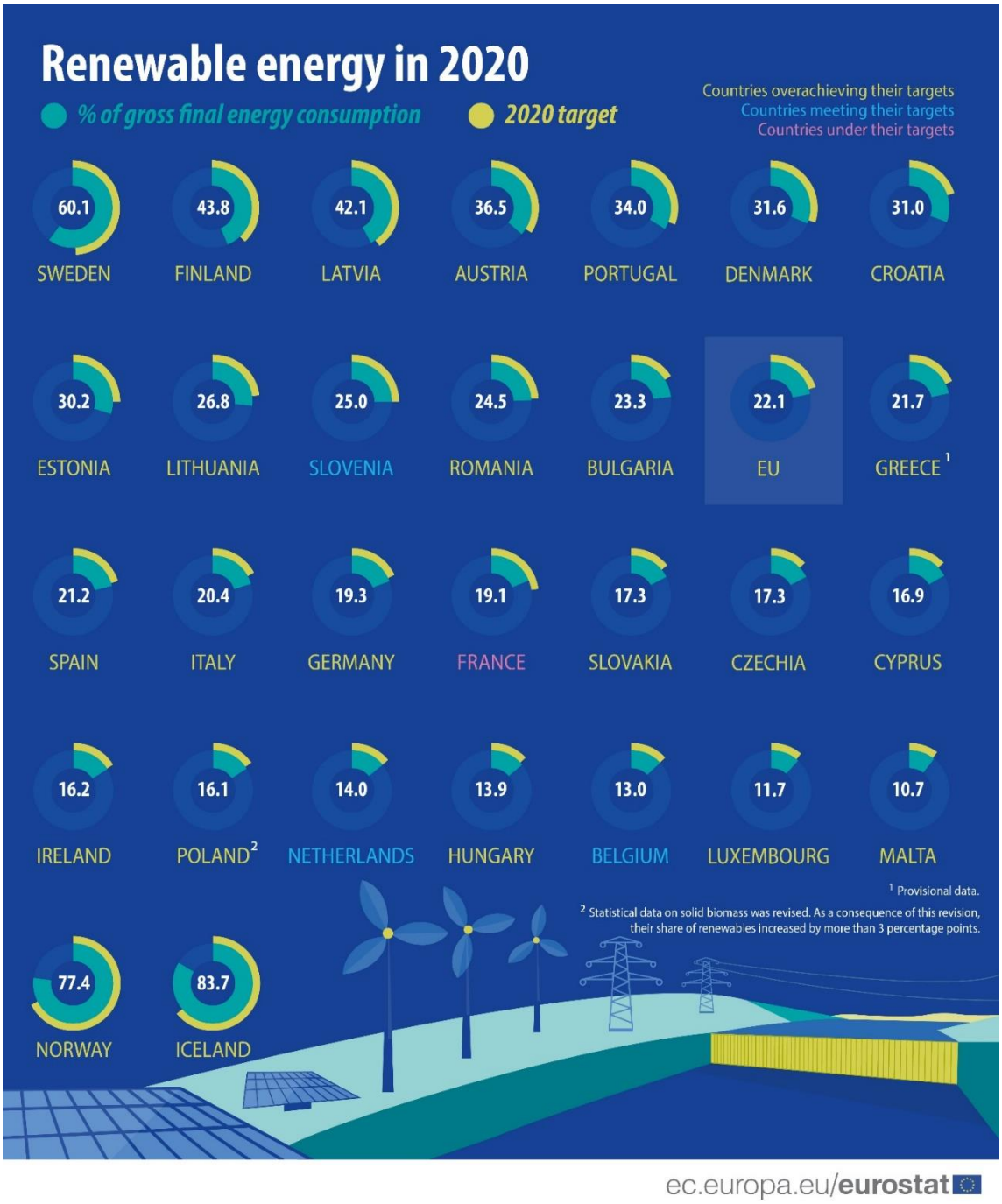

Table 1 Share of renewable energy (as percentage of the final consumption) for each EU country (Source: Eurostat)

3.1 The Energy Efficiency Directive – The 'energy efficiency first' principle

The 'energy efficiency first' principle (EE1st) provides EU legislation with a solid base for underpinning energy policies and should always be considered before major planning and investment decisions that entail additional heating and cooling capacity.

Applying the EE1st principle involves reducing the consumption of fossil energy for heating and cooling by lowering the operating temperature of DHC networks, thereby reducing heat losses and enabling both the recovery of waste heat from industrial and unconventional urban sources, and the integration of locally available, renewable heat sources, thus reducing emissions of CO2 and other harmful pollutants.

The proposed new EED article 8 on energy savings obligations excludes energy savings achieved in energy distribution, (i.e. district heating) from counting towards the target of obligatory energy savings as of 2024 (Article 8 paragraph 8. ©). Based on project experience, energy savings are possible in the network and therefore energy savings "achieved in the energy transformation, distribution and transmission sectors, including efficient district heating and cooling infrastructure", should be reintroduced into the text, to count toward the energy saving obligation target in the period from 1 January 2024 to 31 December 2030.

Low-temperature district heating systems are fueled by sustainable heat sources, available locally at low temperatures, thus providing an alternative to the consumption of combustible fuels. This is conflicting with the current EED th9ncentivizesses a switch to efficient heating no matter how the concerned heating device is fueled. It would be valuable to exclude measures that promote fossil fuel technologies and the energy savings deriving from the use of direct fossil fuel combustion towards the fulfilment of the Energy Savings Obligation from 2024 onwards (Annex V of the EED recast proposal[1]), (Corscadden, et al., 2022).

[1] Annex V: "Energy savings as a result of policy measures regarding the use of direct fossil fuel combustion in products, equipment, transport systems, vehicles, buildings or works shall not count towards the fulfilment of energy savings obligation from 1 January 2024".

3.2 The Renewable Energy Directive (RED III)

As the current RES growth rate, stated in REDII is not being met, the target should be at least a 2% annual increase, for market-ready technologies to have a faster uptake, helping the EU to achieve the 40% renewable target, as proposed in RED III.

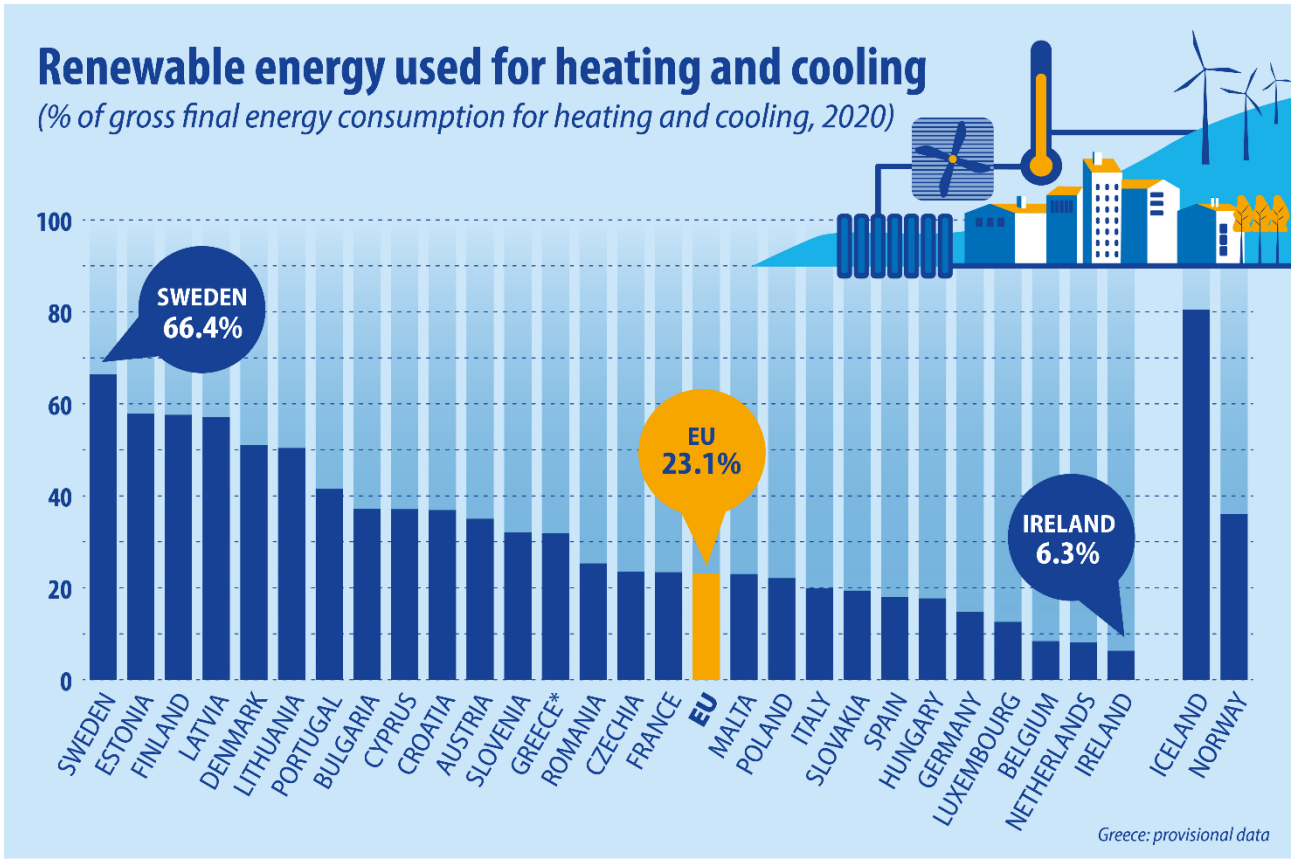

Table 2 Renewable energy used for heating and cooling in each EU country (Source: Eurostat).

Since waste heat from industrial and tertiary sources has the potential to meet the demand for decarbonised heat for buildings, together with renewables, the target of article 15a should cover both renewable and waste heat in buildings. In line with the energy efficiency first principle and the definition of efficient district heating and cooling set out in the Energy Efficiency Directive, waste heat should be mentioned to achieve building decarbonisation. (Corscadden, et al., 2022)

4. COOL DH Policy Webinar

EHP organised an online discussion on 29 April 2022 to share the findings and observations from the COOL DH project regarding the current energy policy framework in the EU and the countries of the COOL DH demo sites.
Steen Olesen from COWI, who has closely followed the project development was chosen to provide in detail the major experiences of COOL DH. It was decided that an external speaker from a relevant or sister project shall be invited to share their perspective on the topic. Last but not least, the policy expert Pauline Lucas from EHP was invited to provide an overview of the current EU context and delineate the recommendations to policymakers. Gabriele Pesce from EHP / DHC+ was the moderator of the discussion.
The webinar was promoted on social media, websites and newsletters.

4.1 Agenda

1. Introduction to the COOL DH project - *Gabriele Pesce, Head of Projects & Sustainable Finance, DHC+ Platform, Euroheat & Power.*
2. Current EU Policies and recommendations - *Pauline Lucas, Policy Manager, Euroheat & Power.*
3. Local Legislative barriers for COOL DH - *Steen Graveslund Olesen, Project Manager, Smart Energy Systems, COWI.*
4. The case of the REWARDHeat project - *Roberto Fedrizzi, Sustainable Heating & Cooling Coordinator, EURAC Research.*
5. Discussion, with questions from the audience.

Figure 1 Promotional banner for the webinar, used in the social media.

4.2 Event Description

The webinar was opened by Gabriele Pesce who welcomed participants, made a short intro to the webinar topic and invited speakers to introduce themselves. After the quick round of introductions, the first presentation by Pauline Lucas followed.

Pauline Lucas from EHP started her presentation with some data regarding the high share of heating and cooling (50%) in total energy consumption in the EU, pointing out that decarbonization of the sector is still behind compared to electricity. Then she showed some examples from countries with intensified and effective efforts for decarbonising heating and cooling, that prove the ability of district heating systems to integrate renewable energy sources and waste heat.

Lucas highlighted that it's not one single technology that will decarbonize the heating sector but instead it entails a combination of renewables and waste heat but also energy efficiency that will enable district heating to operate in low temperatures. She added also that optimisation of the networks is important and it depends on sector integration and digitalisation.

Concerning the legislation and specifically the EU's Directives, Lucas expressed the need to upgrade the role of waste heat to be considered equally important as renewable energy (RED III Article 15a, 23, 24). Waste can have a crucial role in applying the energy efficiency first principle. For the same reason, the risk mitigation schemes (RED III Article 23) shall also be available for waste heat, apart from renewables. Similarly, Lucas explained that the Definition of Efficient DHC (EED Article 24) shall also include waste heat to for district heating systems to integrate as much as possible. She continued that it could be beneficial to provide means for smaller cities to achieve local heating and cooling plans, as the planning obligation involves cities with more than 50.000 inhabitants (EED Article 23).

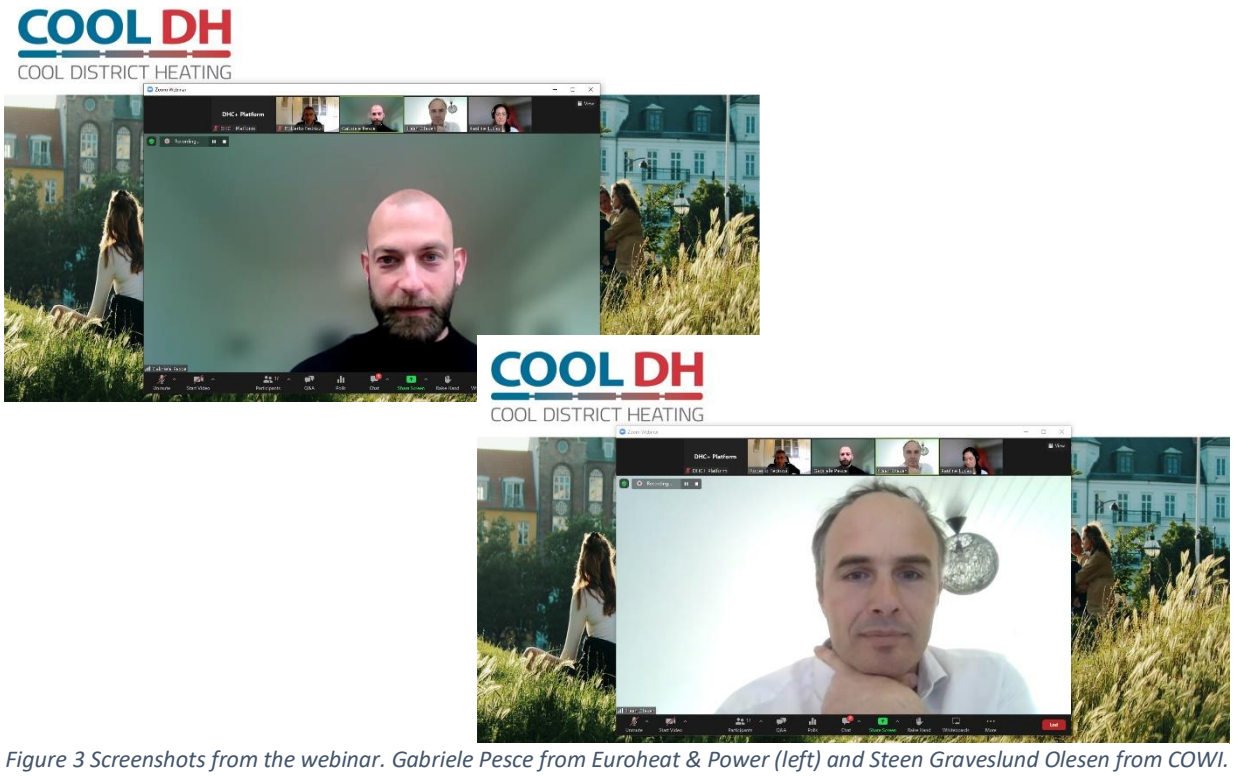

Figure 3 Screenshots from the webinar. Gabriele Pesce from Euroheat & Power (left) and Steen Graveslund Olesen from COWI.

An important remark Lucas made on the current geopolitical situation when asked by Pesce was that coal might replace natural gas in the short term in order for district heating companies to mitigate the high prices. However, the medium to long-term goal shall be the integration of more renewables and

waste heat. The important link between increased integration of renewables and waste heat and the stability of district heating needs to be emphasized also in the RePowerEU plan.
The presentation by Steen Graveslund Olesen from COWI followed where the experience and observations from the COOL DH project were in focus. Steen G. Olesen stated that the project developed and deployed at the demonstrators technical solutions that have been tested and are now ready to be implemented, and praised the solutions are technically and economically attractive. He also mentioned the abundance of waste heat and highlighted that waste heat is also ready to be picked up. Olesen also emphasized the project's replicability as the partners have already found areas where the COOL DH concepts and solutions can fit.
He pointed out though that the legislative framework today in the COOL DH countries, Sweden and Denmark is not fully facilitating the implementation of these projects. In particular, the Swedish market-driven framework weakens the business case of a district heating company that cannot ensure they supply all customers in certain areas. On the Danish side, deregulation to some extent is needed to move faster with the heat transition and be able to utilise more waste heat sources.
Roberto Fedrizzi from EURAC made a short introduction of the aim and objectives of the REWARDHeat project. An important remark on waste heat he made was the absence in RED and EED of clear definitions to evaluate whether waste heat is considered a green investment. Discussion followed the presentations.

The session lasted 120min. There were 37 registrations and 22 attendees from 10 countries. The participants were representing utilities, municipalities, authorities, industry and consultancy companies. The webinar was recorded and the video was uploaded, with subtitles at the time spots where Pauline Lucas' sound was distorted, on EHP's YouTube channel (link) and a dedicated post was created at the COOL DH website (link).

5. Policy Recommendations

A crucial factor for low-temperature district heating is the integration of waste heat sources. Thus the most significant recommendations the COOL DH project has to propose to policymakers involve the **upgrade of waste heat in the EU legislation** that would enhance its competitiveness and facilitate its market uptake. Since the EU produces more waste heat than the demand of its entire building stock, it is clear that this by-product can be turned into a resource instead of being released into the environment. It constitutes an effective way, alongside and in combination with renewable energy solutions such as geothermal, (large-scale) heat pumps, biomass, or solar thermal, to decarbonise district heating networks and as a result the heating and cooling sector.

In particular, it is **necessary to define waste heat** and **treat it evenly with renewables**. In order to avoid limiting the recovery and use of this resource, waste heat must be addressed in the proposed new definition of efficient DHC (EED article 24) and the sub-targets of the renewable energy directive (REDIII article 15a, article 23 and article 24). This is important to reduce the risk that waste heat is not chosen because it is not defined as a renewable energy source. In the meantime, the principle should be to **recover waste heat when available** and when it is technically and commercially viable, regardless of its source. The installation of additional capacity should not be prioritised over the consumption of readily available energy sources. The fit-for-55 package must ensure a level playing field for all heat supply technologies, including waste heat recovery solutions (Corscadden, et al., 2022).

Furthermore, it is quite important that **the EU Emisstion Trading System cover all GHG emissions** from fossil-fueled individual heating systems. Adopting a uniform carbon price policy and a level playing field across the heating sector, the District Heating and Cooling sector can be more competitive and faster decarbonized. A proposed measure is the **introduction of a carbon tax** (e.g. for all new constructions that use fossil-fueled heating) that will include externalities and tally the future damage costs of carbon emissions by a penalty.

Additional measures that can be adopted by policymakers can be:

- Making waste heat recovery standard by obliging all new constructions to utilize excess heat from possible processes (ventilation, cooling, other);
- Allow local non-fossil co-production of heat at the consumer level also in areas where District Heating connection is obligatory (it e.g. could be the use of condenser heat from cooling plant or use of solar energy)
- Set demands to maximum allowable return temperature from consumer to District Heating system e.g. to max 45^{o}C and allow DH companies to disconnect if not fulfilled. In new districts, the temperature demand could be set even lower. This is very important because a few consumers that are shortcutting the District Heating by returning water at a temperature close to the DH flow temperature can hinder the utilization of waste heat or reduce the whole system efficiency dramatically, especially in the summer period.

References

Corscadden, J., Scotton, S., Lucas, P., Vanbecelaere, J., Lygnerud, K., & Fedrizzi, R. (2022). *Position Paper on Key Texts of the European Commission's Fit for 55 Package.* REWARDHeat Project (Funded by EU under Grant Agreement No. 857811).