RES DHC

Renewable Energy Sources for District Heating and Cooling

Transformation of existing urban district heating and cooling systems from fossil to renewable energy sources

Renewable Energy Sources in District Heating and Cooling

# Policy recommendations

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# 1. INTRODUCTION

In this comprehensive document, we present a set of policy recommendations aimed at specific target groups. These recommendations have been formulated by amalgamating insights from the EU-funded RES-DHC project, enriched with expertise from other prominent initiatives and contemporary research in the field of district heating and cooling. To provide a more detailed understanding of our approach, these recommendations are meticulously tailored for distinct stakeholder groups, which are further elucidated in Section 3.

The objective of this document is to actively foster the transformation of district heating and cooling (DHC) systems within regions still relying on fossil fuel-based heating systems. In fact, our commitment is to shift the paradigm from fossil fuel dependence to a reliance on renewable energy sources, thereby guiding in an era of economically and ecologically sustainable DHC systems. While certain measures implemented within this transformation may be context-specific to some regional or national landscape, many of them can be embraced and implemented as effective models throughout the European Union.

## 2. STAKEHOLDER MAPPING

Stakeholder mapping for policy recommendations in the field of RES based DHC systems involves identifying and categorizing the key players who have a stake in the development and implementation of such policies. This process helps us understand who can influence or be affected by these policies. By pinpointing these stakeholders, we can engage with them effectively, consider their perspectives, and tailor our recommendations to ensure they align with the diverse interests and needs within the sustainable DHC ecosystem.

| Stakeholder Group | Description |
|---|---|
| Public authorities | Public authorities (National governments, Regional, City, Municipal) are key decision makers that influence developments within their jurisdictions. Cities are key actors in the energy transition that take local action to accelerate the global uptake of renewable energy. City governments are often more ambitious than their national counterparts in their efforts to decarbonise heating and cooling. Cities can act as multipliers for clean DHC through heat planning, exploiting locally available heat sources and involving citizens. An engaged, supportive public authority is often a key success factor. |
| Policymakers | Policymakers are perhaps the most powerful actors in the energy transition, making important decisions about which technologies should be supported, and which should be phased out. They set the decarbonisation targets, the regulatory framework, and the direction of public expenditure. Political support at the European, national, and local levels is vital to enhance the rollout of RES-DHC. |
| Investors | Due to the high CAPEX costs, multiple ownership models, and diverse market conditions between countries, investors are key stakeholders in the DHC sector. While DHC networks have traditionally been financed by either public funding or utilities, modern low-temperature networks seek to attract private institutional investors by aligning with EU taxonomy, offering an attractive green investment opportunity. |
| Consumers | Consumers play an increasingly important role in the energy system as we transition towards a more decentralized system. By becoming prosumers, or joining energy communities, consumers can move away from their traditionally passive role, becoming active players. In the face of rising energy prices, consumer organisations have an important role in protecting vulnerable consumers against the impacts of fuel poverty. |

**Table 1: Stakeholder groups to be addressed by recommendations**

## 3. RECOMMENDATIONS

In this section, we delve into detailed recommendations tailored for specific target groups, aimed at facilitating the broader integration of renewable energy sources (RES) within the district heating and cooling (DHC) sector. These recommendations span a diverse range of subjects and address various challenges associated with the transition of DHC systems towards greater utilization of RES.

### 3.1. Decarbonisation & RES share increase via transformation plans

District heating and cooling grids represent robust infrastructures with extensive planning phases and permitting procedures, often involving high initial capital expenditures (CAPEX). Embracing the principles of resource efficiency and circularity, such as harnessing local renewable and waste heat energy sources, is vital to achieving sustainable development. To ensure cost-effectiveness, it is crucial to integrate DHC infrastructure right from the early stages of city planning. Furthermore, the transformation of the heating and cooling sector towards climate neutrality requires comprehensive planning at the local, regional, national, and EU levels, involving active collaboration with DHC operators.

Cities and buildings are at the heart of the decarbonisation challenge. **While heat infrastructure decisions and implementation remain local, their crucial role in the broader energy system as a flexibility provider makes a structured dialogue to ensure the alignment and coherence between local actors such as cities and EU-level decision-makers an absolute necessity.**

For this reason, we recommend:

- ensuring cooperation between governance levels, and opportunities should be provided particularly for the local authorities to share experiences of decarbonisation processes and to participate more actively in the definition of EU policies. To empower local authorities, we encourage the **formation of local energy committees or task forces** comprising representatives from local governments, businesses, and communities to co-create and contribute to renewable energy policies. This would help municipalities to take an active role in the legislative process on the national and EU level.

- The concept of establishing local "**one-stop shops**" represents a pivotal initiative aimed at creating centralized hubs where building owners and stakeholders can readily access comprehensive information and support concerning heating and cooling opportunities. These

one-stop shops stand as key catalysts in driving the adoption of district heating and cooling (DHC) solutions and propelling the heating and cooling sector toward sustainability and climate neutrality. A crucial aspect is ensuring that these one-stop shops offer accurate, up-to-date, and easily accessible information on a wide array of heating and cooling options, free from bias. Furthermore, stakeholders should have the opportunity to contribute their insights to the provided information. From the heating and cooling perspective, these one-stop shops should leverage local **assessments to pinpoint the most suitable clean heat solution** or combination thereof for specific buildings, while also guiding stakeholders through the process of applying for relevant funding instruments.

As far as EU-policy framework is concerned, RED III states that competent authorities should consider waste heat utilisation when planning, including early spatial planning, designing, building and renovating urban infrastructure, industrial, commercial or residential areas and energy infrastructure. Moreover, an additional European Union directive, the EED, places an obligation on municipalities with populations exceeding 45,000 inhabitants to formulate local heating and cooling plans.

- Regrettably, **the enforcement of these plans is not obligatory**; the text merely suggests that they should be accompanied by appropriate implementation measures "if necessary." Therefore, there is a pressing need to reinforce this provision. Additionally, consideration should be given to reducing the threshold from 45,000 to a minimum of 30,000 inhabitants to widen the scope of municipalities actively engaged in these crucial planning efforts.
- Moreover, to enhance the efficacy of local heating and cooling plans, it is often fundamental to **tailor them to the specific needs of each case**, ensuring alignment with the broader municipal development objectives.

Furthermore, offering support to public authorities in conducting feasibility studies constitutes a pivotal element. By allocating funds for these studies at the national level, we can effectively showcase the feasibility of integrating renewable energy sources into district heating and cooling systems. This approach has demonstrated that achieving a 100% renewable solution does not entail significantly higher costs compared to other alternatives. Consequently, this feasibility study framework holds the potential for seamless integration into municipal heating and cooling plans.

<u>To facilitate the development of urban heat planning:</u>

- stakeholder should be provided with clear experts blueprint and methodological guidelines on **handbook with methodological guidelines on how to increase the RES share in existing networks.** Such guidelines could be beneficial if implemented on a national scale. We recommend implementing such a measure on the national and EU levels, where an overview of all available training activities dedicated to DHC decarbonisation topics could be listed, but also educational materials and case studies.
- On another note, time plays a pivotal role in the expansion of thermal networks. The growth of district heating and cooling networks is a time-intensive process, during which various stakeholders must grapple with the decision of renovating their energy production facilities. From this perspective, understanding the availability of energy from a District Heating and Cooling (DHC) system (spatial energy planning) and the provision of interim solutions to bridge gaps becomes crucial.

One of the key driver to develop transformative plans and decarbonise DHC networks is the EU's Emission Trading System 2 (ETS2), which will extend carbon pricing to all fossil fuels used in buildings from 2027 (in case of high carbon prices, this could be delayed by a year). DHC operators applying for the additional 30% free allocation will be mandated to develop a decarbonisation plan, which will be regularly reviewed. While DHC plants above 20MW are already within the scope of the existing ETS (which represent about 80% of the heat produced), individual fossil heating systems were not. This situation created a market distortion in the heating and cooling sector. For this reason, the EU ETS2 is a step in the right direction enabling a level playing field and driving decarbonisation.

- **However, further adjustments to make the system more efficient would be necessary.** The carbon price for households will be capped at €45 at least until 2030, in order to protect consumers from a heavy social impact on heating bills. However, this could delay the creation of a level playing field between all heating and cooling solutions. **To ensure the swift development of sustainable DHC networks, a complete level playing field should be established by merging ETS and ETS2**.

## 3.2. Low-Temperature DHC

A crucial factor for low-temperature district heating is the integration of waste heat sources and the renovation of buildings.

Therefore, we recommend:

- **Policymakers should foster the recovery of waste heat in the EU legislation**. The potential of waste heat to displace primary energy consumption is great, the EU produces more waste heat than the demand of its entire building stock. If recovered, this by-product can be turned into a resource instead of being released into the environment. Waste heat recovery, in combination with renewable energy solutions is therefore crucial for the decarbonisation of the heating and cooling sector.
- The recent revision of the Energy Efficiency Directive (EED) and Renewable Energy Directive (RED) fortunately recognises the importance of waste heat under several provisions, but **there are differences in the treatment of waste heat sources.** While waste heat from urban wastewater is classified as ambient heat, it is considered renewable energy. On the other hand, other waste heat sources, which are also unavoidable (following the definition laid out in REDII), are not classified as renewable. Many of the sectoral targets set in RED introduce a distinction waste heat/renewable and a 'penalty' when waste heat in counted towards the target (if waste heat is counted then the target increases). **Recovering and using waste heat when available and when it is technically and commercially viable, should be privileged as it is an existing and available resource that does not need to be produced**; it is a prime example of resource efficiency and an illustration of the energy efficiency first principle.
- To increase the speed of waste heat utilization **the local heating and cooling plans should be mandatory to implement** if technically and commercially feasible (see above).
- **Building renovations are key to accommodate low-temperature heating stemming from waste heat and renewable sources**. The negotiations pertaining to the Energy Performance of Buildings Directive (EPBD) and the EU's Renovation wave are anticipated to contribute to an elevated rate of building renovation. However, other sectors relying on the renovated buildings should be informed about the current state of energy efficiency of buildings. For this reason, the Energy Performance Certificates (EPCs) of buildings should signalise **whether the building is ready for low-temperature heating solutions, and such information should be available for heat providers.**
- Furthermore, **economic incentives should be created for low-temperature DHC networks** to ensure the connection of new, energy-efficient buildings. The development of RES and WH DHC networks comes with a high CAPEX, however, it is economically more feasible for consumers to connect to a DHC network than to invest in individual heating solutions. To

ensure a level playing field between individual and centralised heating technologies government should create economic incentives for RES and WH DHC development.

### 3.3. Thermal Energy Storage

**DHC systems have inherent energy storage capacity in the heating grids and for buildings being connected to them. Moreover, when integrated in DHC networks, thermal energy storage** (TES) **can act as a bridge between the heating and the electricity sector.** TES can store energy for short-term to balance the mismatch between renewable electricity production for example from photovoltaic panels during the day and the need to heat houses during the evening, but also store waste heat during its availability and deliver it to households during heating demand periods. Large-scale thermal storages are also capable **of storing energy seasonally between summer renewable energy production and winter heating demand.** Besides being the **cheapest way to store energy,** it is also maintenance-free and easy to operate. TES does not require raw materials and does not contain dangerous substances – only hot water. Its connection to the electricity grid via e-boilers and large-scale heat pumps could integrate the heating sector into the electricity grid to provide the necessary flexibility and balancing services. To harness the potential of TES the EU needs to create a legislative environment which would ensure the uptake of the technology.

**Together with additional thermal energy storage DHC systems can provide flexibility in terms of electricity consumption to utilise and integrate renewable-based electricity** otherwise to be curtailed**, for example via heat pumps and electric boilers**– to be used in DHC systems or industrial processes.[1] **E-boilers** (electric water heaters) **and large-scale heat pumps could consume surplus renewable electricity to provide hot water for thermal storage but also supply cold through district cooling grids at the time of low-price electricity hours.** To ensure such integration of the heat sector into the electricity grid short-term price signals are necessary, but also digitalisation of the sector is needed (e.g. weather forecast data automatically controlling thermal storage).

[1] European Commission, Directorate-General for Energy, Wiedermann, A., Calderoni, M., Bernstrauch, O., et al., Coupling of heating/cooling and electricity sectors in a renewable energy-driven Europe, Wiedermann, A. (editor), Calderoni, M. (editor), Publications Office of the European Union, 2022. Available: https://data.europa.eu/doi/10.2833/284458

Denmark, for example, is one of the frontrunners in installing solar and wind energy power production and has thus faced increased needs for balancing intermittent production. In their case, district heating systems and thermal storages have been key in the ability to increase intermittent power production with retained energy system efficiency and low total $CO_2$ emissions.[1]

Policy recommendations:

- set **short-term price signals to ensure the market uptake of all forms of energy storage and Power-to-Heat at the time of low electricity prices.** Dynamic pricing provides incentivises for active and flexible customers.
- ensure that **hot water stored in thermal storages providing flexibility and balancing services to the electricity grid is considered renewable heat** when discharged into the district heating and cooling grid.

  For example, in the Netherlands, stored hot water is seen as renewable under specific conditions. Here, formal agreements and certificates aren't needed, and regular electricity turns green if:

  - It's used for a maximum of 1500 hours when there's extra sustainable energy.
  - Only up to 15% of total heat comes from electric boilers or heat pumps.
  - The facility's operator keeps a record of using the relevant technology within set limits.
  - A heat network reserve exists and serves over 500 connections, validating quality claims for up to 3 years.

- **ensure that DHC and its integrated technologies can benefit from the energy price signals and generate revenues for providing flexibility and balancing services to the electricity grid.**
- develop **grid connection products** that foster Power-to-heat flexibility applications, to lower the connection fees that disincentivize flexibility from P2H.
- Electric boilers are great to utilize with storages. This is because they have small investment costs per installed capacity. This means they can run fewer hours per year and still be profitable. Hence companies can build large electric boilers that can follow the production curves

[1] Niklas Fernqvist, Sarah Broberg, Johan Torén, Inger-Lise Svensson., District heating as a flexibility service: Challenges in sector coupling for increased solar and wind power production in Sweden. Available: District heating as a flexibility service: Challenges in sector coupling for increased solar and wind power production in Sweden. Available: https://www.sciencedirect.com/science/article/pii/S0301421522005511

of wind and solar and then not run during hours of normal to high electricity prices. Electric boilers also can ensure that there is no need from the demand side to curb RES generation during high production hours. **To ensure an economic operation of TES the distribution/transmission tariffs need to be adapted** to support this kind of demand elements.

- To successfully connect thermal energy storages with DHC networks, but also with the electricity grid **digitalisation is a key factor** which has to be addressed by policy measures. Digital data should be available for heat distributors and thermal energy storage operators while respecting private data and business secrets. Furthermore, based on the project results from France the **creation of two standardised action sheets would be also beneficial,** which could be enabled by financing intelligent grid management. One for the installation of storage capacity in a heating or cooling network, the other for the monitoring of substations in a heating or cooling network.

The mentioned policy recommendations could be implemented by Public Authorities, which would ensure financial stability in the deployment of TES to draw the attention of Investors, while consumers would receive heat with a higher share of renewables and waste heat.

## 3.4. Solar district heating

**Solar thermal energy is a renewable and sustainable energy source that harnesses the power of the sun to generate heat**. One of the significant applications of solar thermal energy is in district heating systems. **These systems can be implemented in either centralized or decentralized ways,** offering various benefits and challenges depending on the specific context and requirements of the region.

**Centralized District Solar Thermal Networks**

Centralized district solar thermal networks are designed to generate and collect solar heat in large solar thermal fields. These fields consist of multiple solar collectors, such as flat plate collectors or concentrating solar collectors, strategically positioned to capture sunlight efficiently.

The thermal energy is transported via district heating networks to supply heat to residential, commercial, and industrial consumers. Compared to decentralised solar thermal district heating networks large-scale solar thermal fields can achieve higher efficiencies due to advanced technologies and economies of scale. Usually, centralized systems include thermal energy storage, enabling the distribution of heat even during cloudy periods or at night.

However, there are many challenges which should be addressed through policy measures. For example, **large solar thermal fields demand significant land areas**, which may pose challenges in densely populated regions and may **require lengthy permitting processes.** Furthermore, solar thermal energy production may vary with seasonal changes, requiring additional energy sources or storage solutions during low-sunlight periods. Building large-scale solar thermal fields and district heating infrastructure can also require substantial upfront investment (CAPEX).

To address the abovementioned challenges the following policy measures are recommended:

- **Financial Incentives for Investors:** Public authorities should offer financial incentives such as tax breaks, grants, and low-interest loans to attract private investors to fund the development of centralized district solar thermal networks. These incentives can help **offset the high upfront capital costs associated with building large-scale solar thermal fields and district heating infrastructure.** By encouraging private investment, the burden on public funds can be reduced while accelerating the adoption of this technology.
- **Streamlined Permitting Processes:** To address the challenges related to land use and permitting, **public authorities should streamline the approval process for establishing centralized solar thermal fields.** Special task forces or designated agencies could be created to expedite the permitting process while ensuring environmental and social impact assessments are still conducted. By reducing bureaucratic barriers, the development timeline can be shortened, making it more feasible to implement these projects in densely populated regions. This has been partly addressed within the REPowerEU.
- **Land Use Planning and Zoning Policies:** Based on the policy measures adopted by the German project partners we could recommend, that public authorities should **proactively plan for the integration of large solar thermal fields in land use and zoning policies.** Identifying suitable locations for such projects, such as brownfield sites, abandoned industrial areas, or rural locations, can minimize conflicts with existing urban developments. Additionally, public-private partnerships can be encouraged to repurpose underutilized land for solar thermal projects, promoting sustainable land use practices.
- Seasonal Energy Storage Incentives: Public authorities should provide incentives for integrating seasonal energy storage solutions with centralized solar thermal networks. Energy storage technologies like thermal storage systems, molten salt storage, or even renewable hydrogen storage can be promoted through grants or subsidies. These storage solutions can

ensure a stable energy supply during periods of low sunlight, enhancing the reliability and resilience of the solar thermal district heating networks.

- **Public Awareness and Education: Public awareness campaigns can highlight the environmental advantages, energy cost savings, and job creation potential of these projects**. Moreover, energy efficiency programs and consumer incentives can encourage end-users to connect to the district heating network, further enhancing the viability of the centralized system.
- **International Cooperation and Knowledge Sharing:** To address the policy measured by Germany public authorities should **foster international cooperation and knowledge sharing to learn from successful solar thermal projects in other regions**. Collaborating with countries that have well-established solar thermal networks can help overcome challenges and identify best practices. This international exchange of knowledge can lead to more efficient policy design and implementation.

**Decentralized District Solar Thermal Networks**

In contrast to centralized systems, **decentralized district solar thermal networks employ smaller-scale solar thermal installations distributed across the district.** These decentralized systems are often integrated into existing buildings or industrial facilities, using rooftops or facades to host solar collectors.

Decentralized district networks can supply heat locally to specific neighbourhoods or buildings. **They offer more flexibility in terms of installation and can be an attractive option in areas with limited available space for large solar thermal fields. Compared to centralised solar thermal district networks its advantage is that it utilizes available rooftop and facade spaces,** reducing the need for additional land, and can be adapted to meet the specific heating needs of individual buildings or neighbourhoods. One big advantage is, that the shorter heat transportation distances result in lower heat losses during distribution.

However, managing multiple decentralized systems may require sophisticated control and monitoring to ensure optimal performance. Furthermore, individual systems might have slightly lower efficiencies compared to large-scale centralized systems, and equipping existing buildings with solar collectors can be technically challenging and costly in some cases.

To address the abovementioned challenges the following policy measures are recommended:

- **Financial Incentives for Consumers and Investors**: For consumers, incentives like rebates, tax credits, or feed-in tariffs can make the installation of solar collectors on rooftops or facades more financially attractive. For investors, incentives such as grants or low-interest loans can help offset the initial setup costs and incentivize them to invest in decentralized solar thermal projects.
- **Technical Support and Training**: To address the technical challenges associated with equipping existing buildings with solar collectors, public authorities should offer technical support and training programs. This can include w**orkshops, certifications, and access to experts who can guide building owners or managers through the installation process.** By building capacity and knowledge within the industry, the adoption of decentralized solar thermal systems can be facilitated.
- **Standardization and Certification:** Establishing standardized guidelines and certification processes for decentralized solar thermal installations can ensure quality, safety, and efficiency. Public authorities should work with industry stakeholders to **develop** these **standards, which can build consumer confidence and simplify the permitting and approval processes for such projects.**
- **Smart Energy Management and Monitoring**: To address the need for sophisticated control and monitoring, public authorities should promote the **integration of smart energy management systems for decentralized district solar thermal networks**. Smart technology can optimize the performance of individual systems, ensure efficient heat distribution, and allow for real-time monitoring to identify and address issues promptly.
- **Demonstration Projects and Public-Private Partnerships:** Public authorities can facilitate the development of demonstration projects to showcase the benefits of decentralized solar thermal networks. By partnering with private investors or companies, these **projects can serve as models for others to follow, demonstrating the feasibility and effectiveness of such systems in specific neighbourhoods or buildings** – such examples are already existing and operating in Paris and Berlin, which are often viewed as showcases of the technology.

## 3.5. Permitting Processes

Green transition towards more renewable energy sources requires tackling slow and complex permitting for major renewable projects. A targeted amendment to the Renewable Energy Directive to recognise renewable energy as an overriding public interest.

Policy recommendations:

- **Dedicated 'go-to' areas for renewables should be put in place by Member States with shortened and simplified permitting processes in areas with lower environmental risks**. Renewables go-to area' means a specific location, whether on land or sea, which has been designated by a Member State as particularly suitable for the installation of plants for the production of energy from renewable sources, other than biomass combustion plants[1]. To help quickly identify such 'go-to' areas, the Commission is making available datasets on environmentally sensitive areas as part of its digital mapping tool for geographic data related to energy, industry and infrastructure.

On 22 November 2022, EU energy ministers agreed on the content of a Council regulation laying down a temporary framework to accelerate the permit-granting process and the deployment of renewable energy projects[2]. The regulation introduced urgent and targeted measures that address specific technologies and types of projects, which have the highest potential for quick deployment and the least impact on the environment. These rules set maximum deadlines for granting permits for solar energy equipment, upgrading existing renewable power plants (repowering) and the deployment of heat pumps.

- While these streamlined permitting procedures for implementing renewable energy sources has been established, **it is essential to extend simplified permitting processes to DHC pipeline installations and building DHC infrastructures as well.** By doing so, we can facilitate the adoption of DHC systems and promote their integration into the broader energy infrastructure.

[1] EUR-LEX - 52022PC0222 - EN - EUR-LEX. (n.d.). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A222%3AFIN&qid=1653033811900

[2] Store, J. (2022) *EU to speed up permitting process for renewable energy projects*. Available at: https://www.consilium.europa.eu/en/press/press-releases/2022/11/24/eu-to-speed-up-permitting-process-for-renewable-energy-projects/ (Accessed: 08 August 2023).

- A measure simplifying and standardising bureaucratic procedures for the project development of district heating networks run on renewables has been developed with great success, and we recommend its implementation on wider, national and EU levels.

## 3.6. Sector integration

District heating and cooling networks, when combined with power-to-heat solutions such as large-scale heat pumps and e-boilers, as well as thermal energy storage technologies, play a crucial role in absorbing significant amounts of renewable and waste heat from other industries and variable green electricity, thus providing flexibility, and balancing to the energy system. Additionally, combined heat and power plants can provide the necessary system flexibility during peak loads, enhancing the overall resilience of the energy system. This makes **DHC networks essential components for the decarbonization of the energy sector as a whole**.

The Commission's Recommendation on Energy Storage, which **recognises the importance of district heating and thermal storages and its potential balance and flexibility, should inspire Member States to roll out such measures.** The document states, that ***"thermal storage, in particular large thermal storage in district heating systems, can provide flexibility and balancing services to the electricity grid and therefore provides a cost-saving system integration solution by absorbing variable renewable electricity production".***[1] However, concrete policies should be adopted not only on EU but also national levels.

To ensure the uptake of market driven and sustainable sector integration we recommend implementing the following policies:

- a **level playing field between different balancing services/technologies**, which should compete in the market (batteries, heat storage, high efficiency and renewable CHP, demand side flexibility, P2H). The proposed measures to incentivise flexibility are going against a technology-neutral and market-based approach.

[1] Source: European Commission: Commission Recommendation on Energy Storage – Underpinning a decarbonised and secure EU energy system, 14.03.2023, Recital 3-6. Available: https://energy.ec.europa.eu/system/files/2023-03/C_2023_1729_1_EN_ACT_part1_v6.pdf

- **consider all sectors and technologies which could ensure that the objectives are achieved with the lowest costs for consumers** while meeting climate goals and the transition towards cleaner electricity and energy systems.
- **Waste heat actors have limited opportunities to meet and exchange with each other, they are focusing on their core activities and do not necessarily have the knowledge to cooperate to implement successful waste heat recovery projects**. Some EU projects and initiatives already support cities in their decarbonisation efforts by providing networking opportunities, expert support, peer review and mapping and planning tools. **More public funding needs to be committed to foster better communication** (local, regional and national forums for matchmaking), **spread knowledge** (spreading know-how, good practices and training stakeholders) **and create trust between them** (raising awareness of waste heat). This would increase the integration of different sectors into the district heating network.
- Various regulations need to be more harmonized to help the connections between buildings and DH that use waste heat. **Building performance rules should make a better place for waste heat by introducing a "below 1" factor in the final energy calculation when PEF in not used.** At the territory level, waste heat reuse has a lower impact than any on-site renewable production.
- **Promote advanced risk management mechanisms as waste heat recovery projects have rather high CAPEX and financial risks** (e.g. change in the availability or quality of the waste heat). They require long-term commitments with long pay-back periods, sometimes not compatible with the constraints associated with the development and operation of businesses. These risks are a major challenge to the development of more projects. Comparably, geothermal energy projects which have similar but not identical challenges already benefit from risk insurance or risk mitigation schemes.
    - **Support should be provided to investigate the mitigation of risks for waste heat projects**, for example, insurance schemes and risk analysis methodologies. Training of finance actors to waste heat project financing should also be promoted.
    - **Support pilot projects to implement the concept of credit facility** aiming at better sharing the risk between institutional banks, commercial banks and institutional entities.
- **Fostering the development of long-term planning for cities.** In this perspective, DHC networks should be an integral part of National Energy and Climate Plans and building renovation

strategies, as building decarbonisation can be supported by efficient and decarbonised networks. The recently revised Energy Efficiency Directive (EED) established a mandatory Comprehensive Heating and Cooling Assessment for municipalities above 45 000 population. However, in our opinion, the threshold is too high, and we regret that the recommendations of the assessment are not mandatory to implement. By mandatory implementation of the Comprehensive Heating and Cooling Assessments, locally available heat sources from renewable or waste heat sources of other sectors could be utilized by DHC, creating deep sector integration which benefits both sides.

- In the creation of such comprehensive heating and cooling plans a **specific multi-energy planning tool would be beneficial.** A measure adopted by the French project partners proves, that such a tool would be efficient on national and local scales.

## 3.7. Thermal Energy Communities

Though the RED II EU Directive does not exclude for RECs any form of energy, one of the main gaps in its transposition at the national levels concerns heating and most of the current RECs examples, therefore, have been developed considering only electricity.

Nevertheless, there are already several ongoing experiences on renewable heat supply with direct involvement of local communities, however and, therefore, regulations are clearly lagging behind making their successful implementation and roll-out difficult. As such, it is therefore necessary to adapt and update the strategic and regulatory reference framework for RECs for promoting and duly valorising the contribution of renewable heat, while appropriately considering the undeniable elements of difference with the electricity sector.

In October 2022 the European LIFE ConnectHeat project started, with the aim of promoting the diffusion of renewable heat in energy communities through training activities, collection and analysis of good practices, dialogue with stakeholders and development of 7 pilot cases in different EU countries.

Policy recommendations:

- First of all, **there should be an explicit inclusion of heat supply in the regulation of RECs and the study of an ad hoc model** to allow, if feasible, virtual heat sharing between the members of a REC and evaluation of a possible incentive on the amount of heat shared. This is also connected to the presence of heating prosumers in the network.

- A further option could be **to plan an additional incentive for 'electric RECs'** which decide to also include heat supply and/or to foresee economic support for using renewables in heating networks.
- Another aspect concerns the reduction of risks associated with the implementation of the district heating infrastructure by **providing a revolving fund, a price guarantee mechanism or similar financial instruments.**
- In parallel, **forms of direct financial participation**, such as the establishment of cooperatives for managing the district heating network or crowdfunding, **should be duly promoted** and potential developers of a heating community should be given adequate technical and organisational support.
- Furthermore, **public administrations and local governments should implement their key role**, especially regarding spatial planning and energy modelling, as well as territorial animation and involvement of local communities through communication and awareness-raising activities.
- Finally, following a bottom-up approach, **good practices on successful experiences of community district heating should be collected, analysed and promoted**.

## 3.8. Financing & investment[1]

Today, funding for renewable and clean heat projects is either scattered among various instruments (e.g. Buildings, Energy Efficiency, Energy, Infrastructure) or not directly identifiable. For instance, many Recovery and Resilience Plans (RRPs) do not have any dedicated funding for district heating (Estonia, Slovakia, Poland).

Policy recommendations:

- **Create an EU heat fund or mandatory requirements for national heat funds**. Funding for clean heating in industry is scattered among EFSI, COSME, RRF, Horizon2020, CEF, the innovation fund and the just transition fund. It is not clear for industries which type of support

[1] A European "Action plan for heating and cooling decarbonisation": the key towards climate resilience and energy independence. Available: https://bit.ly/47rkzMD

is most appropriate for their case. The EU heat fund could draw inspiration from the InvestEU Program, bringing under one roof all financing instruments dedicated to accelerating public funding and private investment for renewable and clean heat technologies.

- **Provide special funds for the public pre-financing of heat decarbonisation or enable Member States to do so.** The fund would cover 100% of upfront costs, and paid back through savings on energy consumption costs. High-impact measures should be prioritized, such as building insulation and a switch to clean and efficient heating.
- **Establish priority lanes for state aid projects related to clean heat**: In connection with the Sovereign Fund initiative and further flexibilisation of the State aid framework. For example, the adoption of the recent "Clean heat state aid scheme" in Germany took more than 2 years.
- **Reform the Multiannual Financial Framework (MFF) or create new financial instruments to include direct funding for local authorities**: If capital cities can access support from the EIB (through ELENA for instance), smaller municipalities who are engaging in projects are not big enough to be eligible for the fund.
- **Support local authorities with funding for fulfilling climate protection obligations**: Some Member States developed national programs to support local authorities financially in the realisation of their heat plans (e.g., Netherlands funding dedicated staff, Baden-Württemberg [DE] which can cover up to 80% of their costs).

## 3.9. Conclusion

This comprehensive document summarises a series of policy recommendations tailored to specific target groups relevant to the renewable district heating and cooling sector. These stakeholder groups include public authorities, policy makers, investors and consumers. The recommendations are based on recent research in the field of district heating and cooling, combined with the results of the RES-DHC project and know-how from other projects.

These recommendations address the multiple market uptake challenges associated with the transition of DHC systems to higher shares of RES. The aim is to shift reliance from fossil fuels to renewable energy sources, creating the conditions for environmentally and economically sustainable DHC networks. Our approach has involved a wide range of stakeholders - a crucial process in the development of policies for RES-based DHC systems. This engagement ensures that our recommendations

are aligned within the sustainable DHC ecosystem, considering a wide range of perspectives and needs.

The central importance of decarbonisation and increasing the share of renewable energy, mainly through transformation plans, emerges prominently. These plans emphasise the need for robust co-operation between levels of government, the establishment of local 'one-stop-shops' and the formation of local energy committees. In addition, the integration of waste heat recovery and the promotion of building refurbishment are seen as key steps in the expansion of low-temperature DHC systems.

Thermal energy storage (TES) is emerging as a key bridge between the heat and power sectors, providing essential flexibility and balancing services. Our recommendations to drive TES uptake include short-term price signals, recognition of TES within DHC networks and policy support for grid connection products. Digitalisation is at the centre as a critical enabler, requiring the availability of digital data to operators while protecting privacy.

Ongoing negotiations on the Energy Performance of Buildings Directive (EPBD) and the EU's Renovation Wave bode well for accelerating building renovation rates. In addition, the EU Emission Trading System 2 (ETS2) is a promising driver for the transition to sustainable DHC networks.

In conclusion, the policy recommendations have the potential not only to transform DHC systems, but also to embrace the overarching goal of transitioning to renewable energy sources. In doing so, we are steering our energy future towards sustainability and resilience - a future in which district heating and cooling play an indispensable role. The recommendations included here provide a roadmap to a future, where cleaner, greener and more efficient energy systems become our reality.

## 4. REFERENCES


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