RESCOOP.EU

# Guidelines on Community Heating and Cooling

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RESCOOP.EU

# Table of Contents

# Research & Background Information

## Abbreviations

**EU** - European Union

**RES -** Renewable Energy Source(s)

**H&C** - Heating and cooling

**CH&C -** Community heating and cooling / citizen-led heating and cooling

**HP** - Heat pump

**TEI** - Thermal energy installation

**TES** - Thermal energy storage.

**DHC –** District heating and cooling

## Methodology and Research

The purpose of these Guidelines is to give a non-exhaustive introduction into the world of renewable citizen-led heating and cooling, including explanations of what they are, how they function, and giving advice on how to replicate successful examples.

For the development of these Guidelines, REScoop.eu and Energie Samen collaborated on researching the drivers and barriers for community district heating in Europe. For this purpose, we analysed four countries. Two countries where community district heating is dominant: Northern Italy in the region Süd Tirol, and Denmark; and two countries where community district heating is up and coming: Belgium and the Netherlands. In order to identify the drivers and barriers, Energie Samen worked together with its members (energy communities) in workshops and community of practices, and organised and participated in different stakeholder meetings. Additionally, they examined the necessary support system to enable energy communities to thrive in the district heating and cooling sector. During interviews with stakeholders in various countries, we not only identified similar drivers and barriers, but also explored the solutions and support mechanisms adopted in those regions.

In addition, this research involved interviewing 13 energy communities engaged in heating and cooling projects across 7 EU countries, the interview questionnaire may be found in the Annex. The information presented in these Guidelines is a comprehensive compilation of insights drawn from Energie Samen's extensive experience, as well as input from various stakeholders such as DSOs (Distribution System Operators) and municipalities. It is further enriched by the findings from interviews and desk research conducted within the district heating and cooling sector.

## About the researched countries

### Belgium

In 2015, Belgium used 214 TWh for Heating and Cooling. District heating accounted for about 2% of this. The Heat Roadmap Europe for Belgium shows an economically and technically viable way to decarbonise the heat sector with higher energy efficiency and lower energy system costs compared to a conventional decarbonised system. The report assessed that the share of district heating should be increased to cover about 37% of the market share of the build environment, i.e. excluding industry.[1]

The region of Flanders has 84 District Heating Networks. In 2021, 83 District Heating Networks delivered heat to 6823 consumers, of which 6479 were residences[2,3]. Therefore, in Flanders, about 0.22% of the residences use District Heating[4]. In 2021 the delivered heat by district heating was 1139 GWh or 4.1 PJ, of which about 4% was for residences.[5] Furthermore, Flanders has 34 energy cooperatives,[6] of which two have running district heating projects.[7] In 2021 those two projects delivered 1.6% of the total heat delivered by district heating networks.[8]

[1] https://vbn.aau.dk/ws/portalfiles/portal/287929422/Country_Roadmap_Belgium_20181005.pdf

[2] https://dashboard.vreg.be/report/Warmtenetkaart.html

[3] https://www.vreg.be/sites/default/files/document/rapp-2022-18.pdf p.15

[4] https://www.vlaanderen.be/statistiek-vlaanderen/bevolking/huishoudtypes 2.89 million households at begin 2022

[5] https://www.vreg.be/sites/default/files/document/rapp-2022-18.pdf p.17

[6] https://www.vlaanderen.be/bouwen-wonen-en-energie/groene-energie/energiecooperaties/overzicht-energiecooperaties-in-vlaanderen

[7] https://apps.energiesparen.be/energiekaart/vlaanderen/cooperaties

[8] Own calculation using https://apps.energiesparen.be/energiekaart/vlaanderen/cooperaties, https://dashboard.vreg.be/report/Warmtenetkaart.html, and https://www.warmtenetoostende.be/prestaties-van-het-warmtenet-2021

## The Netherlands

In the Netherlands, there are a total of 705 energy communities, with 78 actively working on district heating, and 9 have plans to do it in the upcoming years.[9] As of 2021, about 6.4% of the houses, equivalent to 500 000 residences in the Netherlands were connected to district heating.[10] In 2018, the district heating sector supplied 22.8 PJ of heat.

The dominant players in Dutch District Heating include Eneco, Vattenfal, Ennatuurlijk and HVC, with respective market shares of approximately 40%, 25%, 15%, 2%, collectively accounting for about 80% market share together.[11] It is noteworthy that the two biggest players are multinational corporations.

In 2022, there were three operational cooperative district heating companies, with Thermo Bello being the biggest with 222 residences connected and about 9000 GJ of supplied heat a year, about 3.5% of the market share of supplied heat by district heating.[12] The district heating operates as a private market, and is subject to regulation by the Dutch Energy Regulator, the Authority for Consumers and Markets (ACM). The ACM is responsible for granting heat supply licences, establishing maximum price tariffs for supplied heat, and ensuring compliance with the Dutch Heat Act.

The Heat Roadmap Europe for the Netherlands shows that in 2015 the country used 284 TWh for Heating and Cooling. District heating accounted for about 6.6% of this. The Heat Roadmap Europe for the Netherlands also shows an economically and technically viable way to decarbonise the heat sector with higher energy efficiency and lower energy system costs compared to a conventional decarbonised system. The report assessed that the share of district heating should be increased to cover about 56% of the market share.[13]

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[9] https://www.hieropgewekt.nl/lokale-energie-monitor-2022/samenvatting

[10] https://opendata.cbs.nl/#/CBS/nl/dataset/81528NED/table?ts=1626764469228

[11] https://www.cbs.nl/nl-nl/achtergrond/2020/35/warmtemonitor-2019 p.6

[12] https://www.thermobello.nl/product

[13] https://vbn.aau.dk/ws/portalfiles/portal/287931509/Country_Roadmap_Netherlands_20181005.pdf

## Denmark

The dominant players in Danish Community District Heating are energy communities. They have 65% market share in Denmark. Today, there are 385 district heating companies in total supplying consumers with heat. The ownership types vary – 13 are commercial owned, 49 are municipal owned and 323 are district heating cooperatives. The district heating cooperatives are primarily located in smaller cities, while the municipal owned-ones are in the bigger ones.[14]

Largely due to the fossil oil crisis, Denmark moved away from oil to district heating with local heat sources. Because of its cultural tradition and local focus, the development of district heating was carried out by local stakeholders in district heating cooperatives, and supported by national legislation.

## Italy

Italy has at least 100 energy communities,[15] although this mapping is far from completed. District heating cooperatives from Süd Tirol are for instance not yet included. The task of monitoring the development of energy communities does not seem to exist in Italian legislation. However, there are entities that monitor this development. For example Legambiente is an environmental non-profit organisation that monitors energy communities, but fails to provide comprehensive quantitative data. Another example is Confcooperative, which focuses on cooperatives, and accounts for 77 cooperatives in the electricity sector. The incompleteness of the data points towards a necessary effort to improve the monitoring strategies. Contrastingly, the Südtiroler Energieverband (SEV), a knowledge and service company in the energy sector in Süd Tirol, counts with 304 members. Of this large number, approximately 60 are in the district heating sector. Due to the small size of these cooperatives, the SEV plays a crucial role in developing and maintaining the cooperatives.

[14] https://energiesamen.blob.core.windows.net/media/Feasibility%20study%20vs4_aangepaste%20versie_pdf.pdf

[15] Comunità Rinnovabili 2022 by Legambiente

## Introduction

During the recent energy crisis, the wholesale price of gas in Europe increased by a factor of ten in two years[16]. This sharp increase demonstrates the policy failure of relying on fossil fuel heating supplies owned by a handful of market actors. Moreover, continuing dependence on the gas grid places households at risk of bearing the expenses associated with hydrogen blending, or the use of costly hydrogen as a heating fuel. To pave the way for a fair and sustainable future, it is imperative that we break the detrimental connection between public funding, fossil fuels, and the concentration of wealth in the hands of a select few. Energy communities have the capacity to shift this narrative.

Wind cooperatives have proven their ability to expedite the implementation of renewable energy projects, compared to traditional commercial developers.[17] Consequently, it is now crucial for H&C cooperative and citizen-led projects to showcase their potential in helping us achieve our climate targets in time. **Energy communities are the only organisational concept that truly puts citizens at the very centre of the transition.**

Heating represents around half of the final energy consumption in Europe. However, the majority of the EU's Green Deal policies have focused on decarbonising our electricity supply. To effectively achieve our Paris Agreement targets, it is imperative to adopt a dual approach that addresses both heating and electricity decarbonisation. Alas as the below graph shows, a majority of our H&C is still run by fossil fuels.

[16] https://tradingeconomics.com/commodity/eu-natural-gas

[17] Matijssen, J. (2019), The cooperative wind of change?

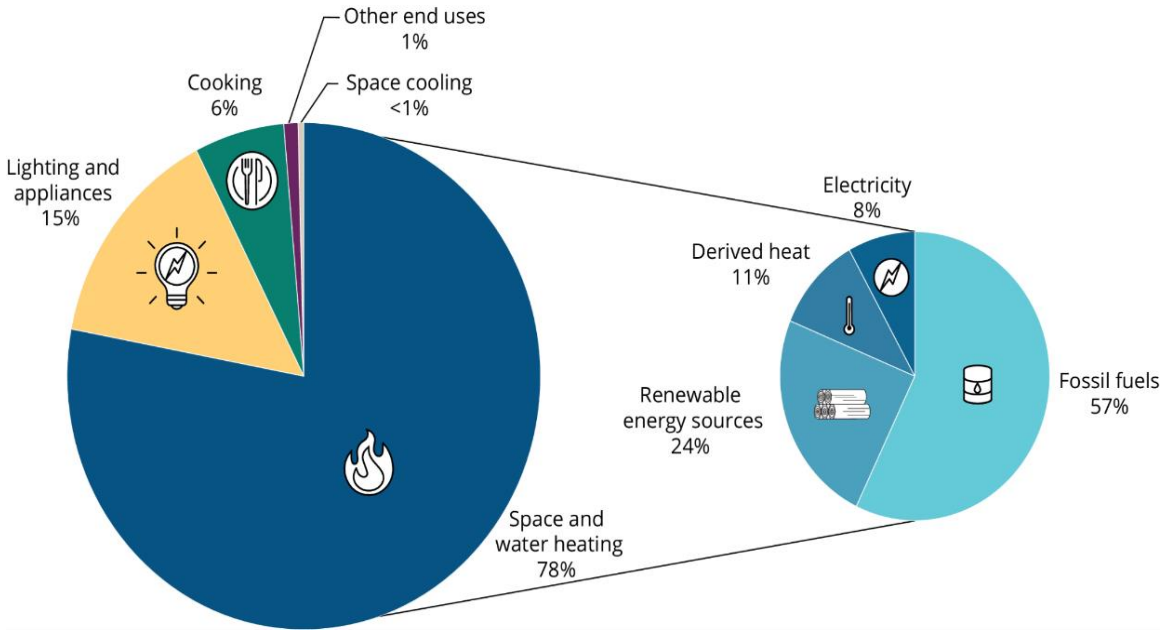



*Figure 1 - SEQ Figure * ARABIC 1 - Final energy uses across EU households, with space and water heating disaggregated by fuel type, 2020*

*Source: https://www.eea.europa.eu/publications/decarbonisation-heating-and-cooling*

The good news is that solutions exist to overcome our reliance on fossil heating and cooling, while democratising our energy sector. The transition to RES H&C is therefore a matter of political will, funding, and the organisational capacity of citizens and civil servants. Indeed, evidence shows that the most affordable clean heating solutions for households across Europe will be efficient heat pumps and connections to a clean district heating system[18]. Very early examples of this can be found throughout Europe's history, as far back as the 1st Century, in the city of Pompeii (Italy), and in the 14th Century, in the town of Chaudes-Aigues (France).

As these Guidelines will show, citizen-owned district heating and cooling are often among the cheapest and most durable solutions, as they do not have a for-profit structure, and can therefore focus on social and environmental benefits such as thermal well-being. Furthermore, this logic also allows energy communities to be inclusive towards low-income households, who oftentimes lack the resources to switch to renewable heating, despite the fact that they suffer the biggest consequences of climate change (as they tend

[18] RAP, *Taking the burn out of heating for low-income households*, 2022.

to live in worst-performing homes, which cost more to heat and cool). Hence, it is imperative that the rapid shift to clean heating and cooling be coupled with guarantees of affordability and citizen ownership of these systems. The transition must be just, or there just won't be a transition - we now have a unique chance to see this mantra put into practice.

### *A bit of history*

District heating, in a primitive form, dates back to ancient Pompeii, circa 1st Century A.D. They used Geothermal district heating, where buildings were heated by circulating hot air and steam from underground furnaces through channels in the walls and floors (McParland et al., 2009). Geothermal water was used to heat the air throughout buildings and baths, and was circulated through open trenches (Bloomquist, 2001, p. 213) The Romans called it a "hypocaust". Later, in the 14th Century, Continental Europe saw its first district heating system in Chaudes-Aigues Cantal (France). A town widely known for its abundance of natural hot springs. The hot water from these springs would be circulated through a network of wooden pipes to provide heating to homes and public buildings. This geothermal district heating system is considered to be the first of its kind, and remains in use to this day (Bloomquist, 2003, p. 516).

## Drivers to Community Heating and Cooling

According to the European Commission, energy literacy, and technical and managerial expertise are recognised as important drivers for renewable heating and cooling technologies. These factors are of general importance, and energy communities actively seek the involvement of citizens possessing these skills. However, energy communities often have specific drivers that motivate them to initiate their community district heating and cooling projects. These drivers, in turn, play a significant role in advancing the local energy transition. To foster this transition, it is imperative to analyse these unique drivers and explore strategies for their promotion at local, regional, national,

and European levels. As we work to stimulate these drivers within energy communities, it is essential to acknowledge that they are interconnected and not mutually exclusive.

### Democratic ownership

The main driver for community district heating is the democratic ownership within the monopoly of heating and cooling. In DH networks, this becomes an even more relevant driver, given that there already is free choice in the electricity market for consumers to choose their supplier. More often than not, in a district heating project the supplier is a monopoly.[19] It becomes clear that the consumer can either rely on proper adherence to legislation to be protected, or for citizens to collectively acquire the company. Indeed, in the absence of democratic ownership, the consumer has no power of choice, and cannot choose to leave the heat monopoly.[20]

This collective ownership has social, economic, and technical benefits that are important drivers for community building. First and foremost, the active participation of citizens in the development of their district heating and cooling network increases social acceptance.

Second, with democratic ownership comes control over the quality of the service provided. Once the project is operational, a consumers relies on the services of the district heating company. If it is a monopoly, and the service is not good enough, the community will need to rely on a third-party (regulator) to act on their behalf. However, when citizens have ownership of the company, the quality of the service can be directly regulated by those enjoying the services, either by selecting a service company (or proxy) that they trust, or providing the services themselves.

However, while democratic control is a right, it is also a responsibility, and as such requires a certain amount of work and commitment. Most people are not familiar with heating and cooling technologies and services, and are not used to systems of collective ownership. Therefore, in order to have democratic control, it is key to keep the members of the

[19] Egüez, A. (2021), District heating network ownership and prices: The case of an unregulated natural monopoly, p.1

[20] Dignum, M. et al. (2021), Warmtetransitie in de praktijk. Leren van ervaringen bij het aardgasvrij maken van Wijken, p.11

community informed. To achieve this goal, **Energent in Belgium** establishes trust by organising informative meetings to introduce themselves and their operations. This sets them apart significantly from traditional private heating and cooling suppliers, known for their lack of transparency in their activities and decision-making processes.

When citizens develop their own district heating there tends to be more social acceptance and therefore reduces the risk of the development.[21] The more social acceptance there is, the more citizens will participate[22] creating a virtuous cycle.

However, the increased social acceptance is not a set outcome of community energy projects. It is instead a consequence of a good participatory process with the citizens in the neighbourhood. An important aspect here is the transparency in the decision making. In energy communities the citizens are directly involved in the ownership of the organisation. It is then natural for the energy community to explain their decisions and involve its members in the decision making process[23]. In the case of Energent, the members of the cooperative are asked to participate in the General Assembly, where Energent informs them about their activities and decides on the future of their organisation.

Others look for more imaginative ways of informing citizens about actions they can take to battle climate change. The **Greek energy community ESEK** organises festivals on renewable energy,[24] and summer screenings of climate and citizen-action documentaries (such as 'We The Power'). They also collaborated with a kindergarten to replace their oil boiler with a biomass one that uses pellets from municipal prunings. This allowed the kindergarten to, for the first time ever, cover their thermal needs with renewables, as well as increase the public acceptance of renewables.

[21] *Social acceptance of renewable energy innovation : An introduction to the concept,* Wüstenhagen et al., 2007
[22] *Eindadvies OFL: Participatie in aardgasvrije wijken,* Overlegorgaan Fysieke Leefomgeving, 2022
[23] *Cost allocation in integrated community energy systems,* Li et al, 2022

[24] Festival on renewable energy: https://www.youtube.com/watch?v=RNKlO7LKMx4


*Image 1 - Collaboration between ESEK and Kindergarten ©ESEK*

Furthermore, to show citizens that even "waste" can be utilised in a circular economy, the members of ESEK went to local coffee houses to collect their residual coffee every 10 days, and put it in a container in the city to show the community their "waste." They then proceeded to mix this residual coffee waste with wood to create a new type of biofuel: coffee-pellets. The school heard about this initiative, and created a school project ('Don't throw away your fuel') to help collect the coffee. They collected one tonne of coffee in 3 months, and proposed to donate this tonne of coffee-pellets to vulnerable households. Since the municipality is also a member of the energy community, the distribution was done by them in order to ensure the privacy of the households affected by energy poverty. The school was awarded the Bravo Schools 2023 award for this initiative: https://www.youtube.com/watch?v=ExfkCn7lBvg[25].

> *This is the key idea: To utilise local resources, and engage the community in renewable heating.*
>
> ESEK, Greece

In another example of awareness-raising activities, during the Christmas period, children were given the chance to send their letters to Father Christmas in the biomass boiler

[25] *Bravo Schools 2023* - Πέμπτη 15 Ιουνίου, QualityNet Foundation

shown below. This initiative is a great example of how to show the community that what some may consider waste, is in fact a treasure in a circular economy.

*Image 2 - ESEK's "Christmas boiler" ©ESEK*

**In the Netherlands**, energy communities engaged in district heating projects collaborated under the banner of 'buurtwarmte' (community heating). They formed a community of practice to share insights and knowledge regarding citizen involvement in decision-making processes. To provide other energy communities with valuable insights, they developed the 'buurtwarmte process', or neighbourhood approach, which serves as a step-by-step guide for engaging local residents in the decision-making process. This approach served as the foundation for an international methodology guide designed for energy communities worldwide.

Meanwhile, **in Denmark**, district heating already enjoys high levels of social acceptance. The assurance of stable and equitable pricing, determined by cooperatives based on costs, contributes to this acceptance. Danish cooperatives invest significant time and effort in communication efforts aimed at explaining the advantages of district heating to consumers. They focus on making the information as comprehensible and relatable as possible, employing two communication channels: a formal one, which includes municipal

websites and official project websites, and an informal one that reaches the community through meetings, local newspapers, videos, and more.

### Not-for-Profit

Heating and cooling cooperatives are one of the most effective ways to protect consumers, because they focus on keeping heating prices as low as possible, given their not-for-profit business model. This also allows them to carry out long-term planning to achieve social and environmental benefits, rather than pursue short-term policies to maximise profits. CH&C projects are therefore the most cost-effective model of renewable energy.[26]

In Denmark this not for profit principle is set in legislation. The Danish Heat Supply Act forces companies to calculate tariffs based on costs, hence the non-profit principle.[27] As a general rule, the Act defines which costs can be included in the price of energy. However, in recent years, an exception was added to the Act, that allows for a margin of profit to be made for specified RES. This was done with the purpose of promoting a transition into RES through economic incentives.[28]

Conversely, in Italy, this not-for-profit principle is considered a logical consequence of their cooperative structure. In the region of Süd Tirol there is a strong cooperative tradition with so-called Raiffeisen banks, social housing, insurance and energy communities. The basic principle is they work for their members for cost price and not for the profit accumulation of third-party investors.

These examples of Community Heating and Cooling (CH&C) culture illustrate two distinct routes toward achieving nonprofit objectives. One path involves legislative support, as seen in Denmark until recent years, which facilitated a significant surge in cooperatives. Conversely, the other path relies on the inherent culture within communities. In the former, legislation often deters businesses and corporations due to the absence of profit incentives, thus leaving room for consumers to foster community development. In the latter, the social culture prevalent in the region provides an ideal environment for

[26] EBO Consult, Energie Samen, 2022, *Cooperative District Heating in the Making.*

[27] LBK nr 2068 af 16/11/2021 §20 (Danish Heat Supply Act)

[28] LBK nr 2068 af 16/11/2021 §20.b (Danish Heat Supply Act)

cooperatives, as the primary goal is collective betterment rather than individual enrichment.

### Local value and Transparency

These cooperatives are deeply ingrained in the local community, benefiting from high levels of engagement and support from residents. This principle proves advantageous when significant changes are required in the energy infrastructure. The transition from a fossil-based heat source to a sustainable one, such as district heating, can be highly disruptive for both the community as a whole and individual citizens. To this end, energy communities can "soften the blow" through their democratic ownership and decision-making.

One of the key drivers frequently emphasised by many energy communities in our research is their unwavering commitment to the local context. Recognising that technical planning is never a one-size-fits-all endeavour, their focus on local life extends to meticulous technical planning within homes and neighbourhoods. Additionally, this approach encourages the efficient utilisation of locally available renewable energy sources (RES) for heating and cooling production, thus avoiding long supply chains that have often negative impacts on climate.

H&C cooperatives are transparent in nature, and therefore conducive to better regulation-making. In Denmark for instance, the regulation is built around transparency of heating and cooling prices in order to uphold the not for profit principle in the Danish Heat law; as a result the district heating market is dominated by cooperatives, as they are the only market actor that have no issue with returning their profit to their members and share their costs with the regulator, since this is directly in line with what their members expect from them.

## Barriers to Community Heating and Cooling

Where there are drivers there are also barriers. The European Commission identified several barriers in the uptake of district heating and cooling.

Firstly, there is a lack of operational signalling, which is needed for technologies with flexibility potential, so that they may respond to market signals, which is particularly important for district heating as it has great potential for sector coupling. Such coupling is even more prevalent among district heating owned by energy communities, as energy communities bring together consumers (i.e. the partaking citizens), municipalities and their public land and buildings, and SMEs; which have the potential to produce, distribute, and/or consume heat.

Another barrier is the length and the complexity of administrative processes, including procedures relating to consent and licensing. While the licensing can be made easier through the participation of the municipality in an energy community, the long waiting times and complex administration are even more burdensome and confusing for citizens unfamiliar with them, this is especially salient for the first project of an energy community.

The physical environment also plays a crucial role, as local circuits are preferable for district heating, especially for networks that utilise biomass. To this end, it is wise to take into account the geographical distance between the source and the sink, and the heat density (demand characteristics) in the feasibility stages of citizen-owned heating and cooling projects. The European Commission has also identified ownership and access rules as barriers. However, due to the citizen-owned nature of energy communities, these barriers do not apply to them. In fact, the democratic structure of energy communities not only helps in increasing public acceptance of renewable projects but also facilitates the attraction of private investments in the clean energy transition.

Nevertheless, unlike the drivers, several of the barriers analysed in Belgium and the Netherlands were not present in countries like Italy and Denmark. The main identified barriers to the expansion of Community Heating and Cooling were a lack of support in their development, the complexity of a H&C network, difficulty in accessing capital, and a tendency to rely on traditional market actors due to a lack of awareness about community projects.

### Lack of support

In Belgium and the Netherlands there is only limited support for CH&C projects. In a competitive market, traditional market actors such as district heating multinationals are not willing to share their knowledge or support local initiatives, without taking over the projects. This leads to every initiative needing to gather its own knowledge and figure out most of the steps by themselves. This is both costly, and time-consuming, and may deter communities from taking on the project. The lack of informational support is therefore an issue.

Taking this into consideration, the Dutch federation Energie Samen has shifted its primary focus toward knowledge sharing to overcome this barrier. With the support of various publicly funded programs, they closely monitor the progress of a select group of pioneers and meticulously document their experiences in knowledge-based materials. Additionally, they've established the Energie Samen Academy, which mirrors the developmental phases of a large renewable energy project, providing comprehensive guidance at every step of the journey. Through this guidance and knowledge-sharing, Community Heating and Cooling distinguishes itself from traditional market actors, and has thus a higher potential for replication.

In Amsterdam the district heating cooperative WGterein made a specific website where they document every action and every decision that they take, in order to help other energy communities and citizens to learn from their activities.

In Denmark and Italy the cooperatives have built shared services companies and strong federations to represent them and share knowledge about their members. The service market from private consultancy companies that cater to energy communities is strongly developed, and starting energy communities have a choice on where they can get their (technical and financial) expertise.

At the EU level, REScoop.eu carries out pan-European knowledge-sharing activities, in order to encourage learning through cooperation.

### Lack of imagination

In countries where CH&C is unknown, the energy communities indicate that municipalities or national governments favour working with private parties. Many civil servants have a

difficult time imagining citizens doing large capital intensive and complex projects, such as heating and cooling networks. They therefore often choose to work with private parties. This is what the Dutch cooperatives called the "lack of imagination barrier."

Not accustomed to the multi-partner network of energy communities, and the want to do things quickly and simply, authorities often delegate the management of their heating and cooling networks to established industry players, neglecting the role of their citizens (such as in France ).

To overcome this, it is necessary to raise awareness among operators and local authorities of the potential of energy communities, and establish criteria to open financial capital to third parties. In short, the heating and cooling sector must be brave to experiment, and doing so with the support of citizens and local authorities.

In this spirit, Denmark and Italy have overcome this barrier. By supporting energy communities, these countries have a plethora of working examples, and constructive knowledge exchange between governmental and citizen-led actors. Here cooperatives in community heating and cooling are now seen as a legitimate alternative to traditional market actors.

There are nevertheless reasons to have hope that this trend is expanding in more Member States. In the Netherlands, energy cooperatives are now working on several knowledge development-and-sharing programmes with representative bodies of municipalities. One such example is the "Coalitie coöperatieve warmte" or Coalition for cooperative heat. Here, Klimaatverbond (the Dutch climate alliance), a regional DSO, the cooperative Rabobank, and Energie Samen (the Dutch federation of energy cooperatives) wrote a strategic ambition together. In it, they demonstrate that there is a third route between public and private companies. This route is made with groups of citizens creating a cooperative to work on their own Community Heating and Cooling projects. All actors involved in this process committed to this strategic ambition, and to work together to build a future ecosystem for these Community Heating and Cooling projects (for more information please see "Supportive Ecosystems for CH&C"). This should give civil servants on all government levels the confidence to opt for citizen-led heating and cooling activities.

### Complexity

Contrary to power production, the development of a heating and cooling project is more complex, as it often includes both production, distribution, and supply in one system. This also means that you need to involve a large percentage of households from the neighbourhood. The participation process involving the community is therefore more elaborate than for power-producing energy communities.

To try to overcome this, Beauvent[29] in Belgium did not start with this elaborate participation process. They chose instead a different strategy, where they first supplied heat to large users in the community surrounding the thermal source. This development process was difficult, but it saved them from dealing with hundreds of customers in their first project. Now that the project is successfully up and running, and people are aware of it, they are expanding to more neighbourhoods in Ostend.

### Access to capital

The biggest barrier to the development of CH&C remains the financial one. District heating and cooling requires large investments in development and construction, yet in most cases there is little to no financial support. For example, EU and national funding programmes often ignore citizen-owned projects (for more detailed information, see REScoop.eu's "Financing Tracker"[30]). This lack of funding for citizens initiatives is benefitting large market players, stifling the introduction of new economic actors, and ultimately creating an uneven level-playing field across the Union.

In order to make Community Heating and Cooling flourish, this barrier needs to be solved. This Guidance document looks into possibilities to balance the financial level-playing field.

In the Netherlands, the Government started a large national programme ("Programma aardgas vrije wijken") where municipalities could apply for a subsidy to start a district heating project from scratch. The first trench had €120 million. There were 74 municipalities competing, of which 27 pilot projects were selected. In 2020 there was a new fund of €100 million which resulted in 19 new pilot projects. 9 of those projects were citizen initiatives. These 9 had the capital to continue their project and are now in either the construction phase, or moving toward financing their project. In North Italy a lot of DHC

[29] https://www.beauvent.be/
[30] https://www.rescoop.eu/financing-tracker

have been financed by cooperative banks and the regional government in the 90's. Besides financing, the banks also helped the cooperatives to start up. Now the funding is more focused on expanding existing Community Heating and Cooling networks. Furthermore, there is implementation of zone dependent subsidies, i.e. in certain areas the only subsidised energy system is DHC.

> *The Danish cooperative model is making it very price-competitive for consumers to do capital investments. If you can reduce the capital cost, you reduce the cost for consumers.*
>
> Gerwin Verschuur, Netherlands.

Contrary to this, In Belgium such support is non-existent, whereas in Süd Tirol (Italy) and Denmark these programs are not necessary anymore as the existing energy communities are successful enough to expand their DHC networks without financial government support. Furthermore, in Süd Tirol and Denmark there is a longstanding relationship between energy communities and the regional cooperative bank. In the case of Denmark energy communities have access to the Municipality bank called the KommuneKredit,[31] (for more information, see "Capital in the construction phase"). Similarly, in North Italy a lot of DHC were financed by cooperative banks and the regional government in the 90's. Besides financing, the banks also helped the cooperatives to start up. Now the funding is more focused on expanding existing CH&C networks. Furthermore, there is implementation of zone dependent subsidies, i.e. in certain areas the only subsidised energy system is DHC.

[31] https://www.kommunekredit.com/

## Supportive ecosystem for CH&C

When looking at the two Member States where Community Heating and Cooling dominates the sector (Italy and Denmark), we see there is a supporting ecosystem present that can be divided into four quadrants: capacity building, access to capital, municipal capacity and a supportive regulatory framework.

As a starting energy community, it is advised to work together with other energy communities to replicate this ecosystem in every region and Member State in the European Union. As an energy community, your knowledge as a pioneer is very valuable to determine the specific barriers for your country or region. You can address the barriers not only for your own energy community, but for all energy communities following your footsteps.

### The 4 quadrants

The ecosystems in both Italy and Denmark can be divided in four quadrants. Within these quadrants are specific supporting measures that helped set up an ecosystem where energy communities could flourish. The four quadrants clearly show how the success of community district heating and cooling is linked with cooperation with the national, regional, or local government.

On one hand, capacity building and access to capital are mostly the **responsibility of energy communities**, and should be organised with the support of the government. On the other hand, regulation and municipal capacity building are the **responsibility of governments**, with the support of the energy communities in that municipality, region, or through a federation on a national, regional, or supranational level, such as REScoop Vlaanderen for Flanders, Energie Samen for the Netherlands, or REScoop.eu for the European Union.

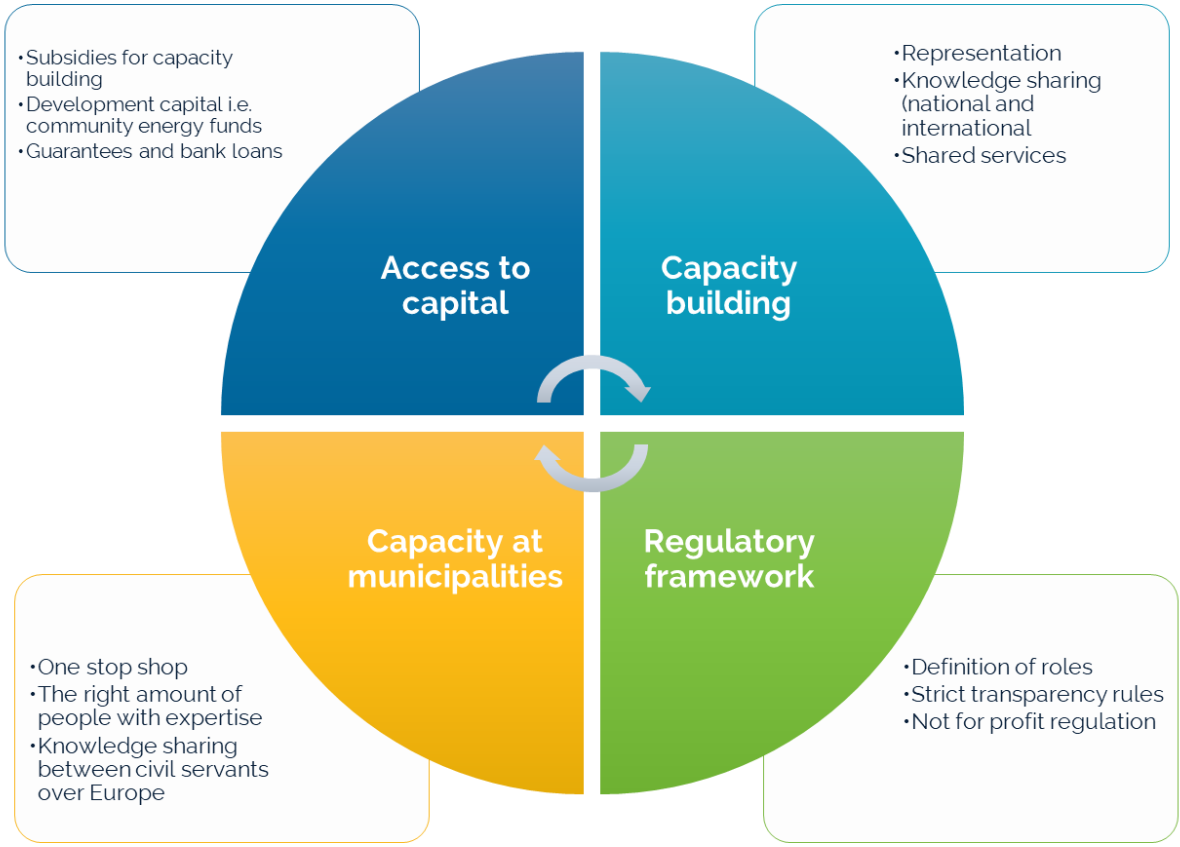



*Figure 2 - the 4 quadrants of supportive ecosystems*

## 1. Capacity building

What we mean with capacity-building is the process of developing and strengthening the skills, abilities, processes and resources that energy communities need to operate, adapt, and thrive in the H&C market. In countries where there is a strong ecosystem for community district heating and cooling, like Denmark, this ecosystem grew, where cooperatives incrementally built up their capacity over more than 100 years. If we want to speed up the process in other countries, the capacity building needs to happen before or during the development of the community district heating sector. Local, regional, national and EU governments need to support this development with specific programs that give energy communities the time and money to build up their capacity in order to support local citizens in the process of building up their own CH&C project. In both countries with strong CH&C ecosystems the capacity building framework has three important components: Representation, knowledge sharing, and shared services.

**Representation:** An important part of capacity building is the representation of energy communities vis-à-vis local, regional, or national governments. To overcome regulatory barriers, it would take too much capacity from individual energy communities to follow and influence the changing legal environment. Cooperation in representation is thus essential. This representation is usually based on bottom up procedures through membership to a national energy community federation.

## Examples from Member States

**Netherlands** - The representation of the Dutch energy cooperatives is organised by Energie Samen. They are the representative of Dutch energy cooperatives towards the government, and advocate for legal changes. For example, Energie Samen was the main negotiator at the Dutch Climate Agreement (2019) and negotiated a 50% community energy target for solar and wind energy.[32] This, in turn, gave local energy communities the position to negotiate their place in the local energy market. In the last four years Energie Samen also successfully advocated for legal recognition of energy communities in the energy law and the heat law. For years, local initiatives were often recognised by civil servants as any other private and for profit market actor. By recognising the role of energy communities in the heat law, the energy communities got the same rights and obligations as public heating companies. This was a necessary step, since the proposals for the new heat law determined that district heating and cooling infrastructure could only be built by public entities.

**Italy** - The Süd Tiroler Energieverband (SEV) functions as a representative for the Südtiroler energy communities to the National Italian Government. They also train their members in, for example, legal issues when regulation changes, tariff changes, calculation and other services.

**Germany** - DGRV[33] checks if projects by cooperatives and energy communities respect the German principle of "Mitglied Förderung"[34], and if their contracts

[32] Government of the Netherlands, *Climate Agreement* (2019), p. 228
[33] https://www.dgrv.coop/
[34] According to German law, cooperatives must ensure "promotion of their members" and their social or cultural interests. The DGRV ensures that their members adhere to this principle.

ensure that the members own and run the energy system. On top of this, and similarly to Energie Samen, they also represent their members vis-a-vis their national government.

**Denmark** - The district heating cooperatives work together in the Danish District Heating Association that represents them vis-a-vis the Danish government and works on influencing rules and conditions of production, transmission, distribution and sales of H&C. For instance, about 20 years ago the Danish District Heating Association introduced a standardised chart of accounts. In preparation for the regulation on benchmarking for district heating companies, a number of them bundled and decided to make their own benchmarking model. This way they could experiment and gain knowledge on benchmarking, which was used to engage in meaningful discussions with the authorities.[35]

**Knowledge sharing:** An important part of capacity building is knowledge sharing, and training people to develop the right skills to set up community district heating.

## Examples from Member States

**Denmark** - The Danish District Heating Association has a broad range of theme days and courses to train their members. On their website[36], there is information on legal, technical, and managerial aspects of a district heating and cooling organisation. They help their members with legal issues, train them, and represent them vis-a-vis the government to make citizen-focused legislation. On a monthly basis there are courses on several topics including financing, taxes, heat pumps, planning.

**Netherlands** - There is an even larger need for knowledge and capacity building. The Dutch federation works in multiple national programs and European projects in order to develop knowledge and disperse them to the members.

[35] Bukh, P.N. and Dietrichson, L.G., Collaborative benchmarking in the Danish district-heating sector (2016)
[36] https://danskfjernvarme.dk/uk/english

They have specific methods where they work with pioneers and early adopters in a community of practices (COP) where these pioneers talk to their peers and learn from each other. Specific knowledge developers of Energie Samen lead and organise these COP. When there are commonalities and the pioneers agree that certain practices are best suited, they create knowledge documents. These can be reports, webinars, drawings or charts which are placed then on the Energie Samen Academie website under the relevant stage of development.

**Shared Services:** Next to advocacy on regulatory affairs and knowledge sharing, Community Heating and Cooling projects can work together on sharing services for the day to day operation. On a regional level energy communities work together to share services, which is done to become more efficient, and professionalise services such as technical support or financial audits.

## Examples from Member States

**Netherlands** - 9 pioneer district heating cooperatives have agreed to set up a shared service cooperative. This will be a multistakeholder cooperative where technical consultants, banks, cooperative consultants and the community district heating cooperatives will become a member. Their aim is to organise the support for starting community district heating projects. The knowledge and expertise the 9 pioneers developed will then be put into practice in many other neighbourhoods. It will, in the first place, support these cooperatives in the whole development process, and especially in ensuring citizen participation. In the future it will supply services like billing, technical support, and financial auditing and control.

### 2. Access to capital

Capital is needed for every CH&C project. If we want the development of community energy to be successful in the European Union, there needs to be access to capital. This does not only relate to bank loans for the construction of the project. There needs to be a national or regional financial framework that creates access to capital for every step of the way, as defined in EU legislation. The Renewable Energy Directive (RED II)

specifies that Member States should take into account the specificities of renewable energy communities when designing financial schemes for renewable energy.

In Denmark and Italy (where there are long running energy communities working on H&C) they often have their own capital to start up and develop these projects, and reserves to manage the risk of the development. However, in the Netherlands and Belgium where community district heating and cooling projects are being set up, access to capital remains an issue.

To move beyond this barrier, energy communities, governments, and financial institutions will need to work together. For example in the Netherlands these organisations created the "Coalition for Cooperative Heat", where a federation of sustainable municipalities, the cooperative Rabobank and the regional DSO Alliander worked together to make a plan to build up the cooperative capacity. In it, they focused on creating new financing options.[37]

Below a graph that demonstrates a suggested financial framework for community district heating:

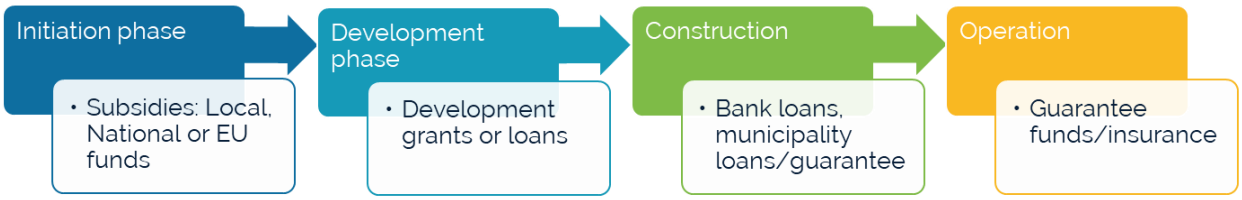



*Figure 3 - financial framework for community district heating*

### Capital in the initiation phase and development phase

The first two phases of development have the highest risk. In these stages the technical plans need to be developed, including information about the cost and technical feasibility. If the participation process is done wrong, and the community is not properly involved, there is a chance of opposition by the community. It is, therefore, hard for energy communities to attract capital without losing autonomy of the project or paying too high

[37] Coalitie coöperatieve warmte, Strategische ambitie

interest on the loans. Therefore, most projects start with social capital (i.e. volunteer work). However, this is not a durable way to stimulate energy communities.

The financing for the initiation phase varies across the EU. Most of the time the support consists of subsidies on a local level from municipalities or regional governments.

In the development phase, where the costs go up, there are often no structural financial support frameworks. This means that energy communities must invest considerable time and energy to solve this barrier, slowing down the process of their development. Those energy communities that have their own reserves work with that capital to build new H&C projects, but many do not have that luxury. This is especially salient for new energy communities. This is the case in Denmark and Italy, where energy communities rely on their own reserves to expand the network and projects. However, in the rest of the EU there are not enough energy communities with sufficient funds to rely on their own reserves.

To overcome this, energy communities need to work together to create access to capital on a national level and with European support. There needs to be a financial framework that: (1) Supports the development of capacity building and early stage plans with subsidies. (2) offers development capital either through guaranteed loans, or revolving funds, and (3) facilitates easier access to bank capital through standardisation and government guarantees.

For instance, BEcoop[38] is expecting to pay for their biomass project through public funds and crowd-sourcing. While 80% will come from public funds, given the strong commitment from the project's municipality, the remaining 20% is raised through cooperative crowd-funding campaigns. The members will be able to make voluntary deposits, which can then be returned. The other alternative was to access loans through cooperative banks.

[38] https://www.becoop-project.eu/

## Examples from Member States

**Netherlands** – The Dutch Federation has its own department to create access to capital for their members. They started this to help emerging energy communities to access capital in the development stage of solar and wind parks. The energy communities can access capital through a national development fund, created by Energie Samen in cooperation with the Dutch National Government. Next to that, they organised a realisation fund in cooperation with the Cooperative Rabobank, and two sustainable banks: ASN and Triodos. This realisation fund finances small solar parks from 25.000 to 1.000.000 euro. This is possible because the transaction costs are low due to the standardisation of contracts and business cases. There is no need for extra marketing costs and account managers. The Dutch government has now decided to expand this development fund to include development costs for district heating and cooling. This will give starting energy communities with no reserves or capital access to loans that they will need to pay back when the project is financed at Financial Close (i.e. when it reaches construction phase). If the project does not reach financial close, the loan does not need to be repaid.

**Belgium** - Beauvent[39] relied on their own reserves of their solar and wind production. This investment was only limited, as otherwise they would have been too exposed to risk.

### Capital in the construction phase

Once an energy community has gone through the most risk-intensive stage of the H&C project, they reach financial close. This is the moment when banks believe the project is developed enough that the risks are acceptable for them.

In countries like Italy and Denmark there is a longstanding relationship between energy communities and the regional cooperative bank.

[39] https://www.beauvent.be/

## Examples from Member States

**Denmark** - Energy communities have access to the Municipality bank, called KommuneKredit[40]. The municipality where the energy community is active can give a loan guarantee to the energy community through the KommuneKredit. The latter bank is an association of municipalities, where all municipalities are liable to each other. The bank, therefore, has a high credit rating. This gives energy communities the possibility to borrow at low interest rates. They are not-for-profit, so they can borrow money from the KommuneKredit for fair and low interest rates. Contrary to this, in the Member States where there is no long relationship between Community Heating and Cooling and the financial institutions, the access to capital is limited or very cumbersome.

The financing of H&C goes in two stages. In the construction stage, the risk is higher than during the exploitation stage, since there are construction risks. For this first stage, Danish energy communities can finance the construction stage with a loan called construction credit offered by KommuneKredit. The loan is a short term financial method with a variable interest rate based on the risk of the construction stage. Once the construction is finished, the loan is changed into a final loan from the KommuneKredit for the exploitation stage. This stage has a lower risk and the interest rates are thus lower. However, it is only municipal owned companies (or companies with a loan guarantee from the municipality) that can take up a loan at KommuneKredit. Moreover, the aim of the loan must fulfil the following criteria:

- The purpose must be public/municipal.
- The activity must be included in the loan act.
- The company must not be exposed to competition.
- The company must not be commercial.
- The non-profit principle must be followed.

In turn, the municipal guaranteed loans create different advantages:

- It ensures a cheap and stable financing of the Danish heating supply.
- It ensures that district heating can expand in all areas in Denmark.

[40] https://www.kommunekredit.com/

- It ensures financing of new projects and expansion of existing district heating grids.

**Netherlands** - The Dutch Government set up another support scheme. The Heat Networks Investment Subsidy (WIS) is for entrepreneurs who can start quickly with the construction of a heating and cooling network. And so they are already far along with their plans. The WIS guarantees that if you go through the development stage, and the technical plans indicate that the costs are too high to become profitable, you can ask for a subsidy to cover the extra needed investment. This gives social entrepreneurs the guarantee to start the project, since they know the government will make it profitable (within limits) at the end of the development stage.

**Guarantees and insurances**

The access to capital in countries where CH&C is not as developed is cumbersome. This is mainly due to the lack of knowledge from the financial institutions about the risks of the exploitation stage. If the financial institutions cannot definitively determine the risk, they will require guarantees or insurances. In some cases, municipalities provide the guarantee for the loans. In other cases, parts of the installations are insured by a service contract provided by the supplier or a general insurance.

## Examples from Member States

**Netherlands** - Municipalities and energy communities are working on developing a guarantee fund to support the establishment of district heating and cooling networks. This development is advised by the Dutch regulator in its analysis of the latest version of the Dutch Heat law proposal. The entity argues that the law is executable, but some insurances need to be in place. One suggestion is indeed the guarantee fund. This fund would make all district heating and cooling processes liable to each other, and will cover the cost when one goes bankrupt and another needs to take over to secure the supply to the consumers.

These kinds of funds do not exist in Denmark and Italy **since there are no known bankruptcies of community district heating and cooling projects**. The reason for this is

the knowledge-sharing of technology, finances, and being transparent about every step. They do not work with a "four eye principle", but a "thousand eyes principle" of members. This means that they help each other to spot problems which could turn into a bankruptcy scenario when not addressed. However, these energy communities spot them early, and address them early. In addition to this, the cash flow of a Community district heating and cooling project is very stable. Once your cost is clear, you recalculate this in the tariffs. Therefore, there is a very low risk of bankruptcy. As a matter of fact, during the interviews with community energy district heating representatives in these countries, they were surprised that this is a barrier in other countries. They argued that we "are solving a problem that doesn't exist" for them.

## 3. Municipal Capacity

The success of community district heating is dependent on the capacity of the local municipality. In other words, there needs to be enough civil servants with the knowledge and expertise to support their citizens in the development of a Community Heating and Cooling project. A municipality can have many different roles, but to execute these roles and to be a stable partner for the energy community, they need to have the right capacity – and must be supported to this end. Especially now that energy communities develop toward more integrated energy systems, it is important that municipalities have a one-stop-shop, or a single department, that connects all involved and necessary civil servants. When citizens' initiatives fail, it is often because they get stuck in the municipality processes due to lack of knowledge or capacity of civil servants.

Thus, forming a partnership with municipalities is of paramount importance in project development. It's wise to invest time initially in arranging agreements with the municipality, defining shared project objectives, their roles, and the required capabilities from both sides. Some cooperatives address this by initiating a Memorandum of Understanding with the municipality. In other cases, such as the example of the energy cooperative WOW in Wageningen, joint ventures are established in collaboration with the municipality and a technical company. This approach ensures that all essential capabilities, including social, procedural, and technical aspects, are in place before launching the project.

In Monastier-sur-Gazeille, France, the municipality became a part of the energy community, given that French law designates heating and cooling networks as a matter of

public interest. This involvement also simplifies the oversight of the cooperative's right to operate.

## 4. Regulatory framework

For Member States there are two ways to support the development of Community Heating and Cooling. One way is to agree that H&C is always in a monopoly position (especially for district heating) and therefore, needs to be a not-for-profit sector with full transparency, as is the case in Denmark. The second way is to ensure citizen ownership in the national legislation that governs renewable heating and cooling.

What distinguishes a not-for-profit organisation (and ensures transparency) is the implementation of clear and strict accounting rules. Consequently, the majority of H&C projects tend to organize themselves as community district heating and cooling entities. This shift renders the market unattractive for external, for-profit companies, ensuring low and stable H&C prices for households. In Denmark, the Danish Utility Regulator plays a crucial role in overseeing compliance with the Heat Act by all district heating companies. The regulator does not dictate whether a company should be privately or community-owned, but instead evaluates the supplier's ability to provide energy at a fair, not-for-profit price that benefits consumers.

On the other hand, when a Member State does not mandate the not-for-profit nature of the H&C sector, another approach is to specify the role of community district heating in the sector through legislation. This definition can ensure equal market access for community district heating and cooling, setting the stage for member states to establish their own support systems to assist citizens in developing their own district heating systems and accessing the market.

Our recommendation is for member states to adopt both approaches. However, as of now, this is not the case. The ideal regulatory framework should include a clear definition of citizen-led, community district heating in their H&C laws, accompanied by robust not-for-profit regulations, and stringent rules governing transparency and accounting.

### Regulatory framework on national level

The district heating and cooling sector is a heavily regulated field due to the monopoly position of a district heating and cooling sector. Every country deals with it differently, but

there is a clear difference between those countries where community district heating is dominant, and those where it is not. There are strong regulations of transparency of prices and price regulation. Surprisingly there are no regulations that prescribe community energy per se, but all other regulations create the pre-conditions in which community district heating and cooling can flourish. We analyse the cases of Denmark, the Netherlands, Belgium (Flanders), and Italy, by looking into their national H&C frameworks, the entity that regulates it, and how they regulate tariffs for consumers.

> *We believe that community district heating should be recognised as a necessity for the transition'*
>
> SUNO, Spain

**Denmark**

The Heating Supply Act governs the district heating provisions in Denmark. This legislation outlines both legal prerequisites for formulating project proposals and regulations for evaluating project proposals based on their economic viability for consumers. The primary objective of this legal framework is to promote the adoption of renewable energy sources. It aims to ensure the economically efficient and environmentally conscious utilisation of energy for heating and hot water supply, while also reducing reliance on fossil fuels.

The Heating Supply Act permits the formation of H&C projects through various entities: solely municipalities, or a combination of municipalities and cooperatives, as well as commercially owned entities. District heating cooperatives hold a legal status equivalent to that of district heating companies. All these entities are bound by the same regulations governing the district heating sector, with no specific provisions tailored solely for district heating cooperatives.

The establishment of a district heating system hinges on comprehensive heat planning. The onus lies on municipalities to create district heat plans. In doing so, municipalities must ensure that heat supply planning aligns with other local and municipal plans. These plans

must also conform to existing legislation, such as the Planning Act, the Building Act, and the Environmental Protection Act, without causing conflicts.

*Regulator*

The Danish Utility Regulator functions as a public institution with a primary mission to ensure robust and efficient oversight of the utility landscape encompassing electricity, natural gas, and district heating. In essence, the Danish Utility Regulator plays a pivotal role in verifying the adherence of all district heating enterprises to the Heat Supply Act. This oversight is carried out with an unwavering commitment to safeguarding consumer well-being. Notably, the emphasis is not on the ownership structure of the district heating enterprise—be it municipal, cooperative, or commercial —but rather on the supplier's capability to furnish energy at equitable rates that ultimately serve the consumer's best interests.

The overarching objective of the Danish Utility Regulator is to champion consumer interests within the utility sectors. This is pursued by striving for heightened efficiency, minimizing both immediate and long-term costs, ensuring a stable and reliable energy supply, and fostering the cost-effective advancement of technology and environmentally friendly initiatives.

*Tariff regulation*

In Denmark, the foundation of district heating rests upon a local heat supply monopoly. Operating as a monopoly, it operates under a non-profit principle, where expenditures and earnings find equilibrium. The Heat Supply Act delineates which costs can be factors into the heat pricing equation—**only those directly linked to heat supply are eligible**. Moreover, depreciation of assets and expenses necessary to ensure the district heating company's financial viability can be included. While heating prices exhibit variability both within and between district heating zones, all pricing falls under the purview of the Heat Supply Act's regulations.

However, departures from the non-profit principle are allowed in instances where renewable energy production facilities contribute heat to the district heating grid—examples being heat pumps, solar thermal, geothermal, or biomass installations. In these scenarios, the district heating company can calculate a surplus. Similarly, industrial entities can compute a surplus when they contribute excess heat to the district heating grid.

To uphold efficiency and maintain oversight of the district heating market, the Danish Utility Regulator formulates price statistics biannually. Consequently, district heating companies are required to furnish semi-annual financial records and a budget to the Danish Utility Regulator. Towards the end of each year, a budget for the following year must be devised, dictating the forthcoming heat price.

Compliance with transparency is paramount. As per the Heat Supply Act, consumers are entitled to foreknowledge of heating prices prior to consumption. Thus, district heating companies are compelled to inform consumers about notable price changes, ideally three months prior to implementation. The non-profit framework also disallows planning for surplus or deficit in a fiscal year. Any surplus or deficit revealed in the annual report should be offset in the subsequent financial year through adjustments to the heating price—this could involve refunding consumers or modifying the heating price accordingly.

### Netherlands

The Dutch Heat Act entered into force in 2014. The Act aims to protect heat users from a potential abuse by the heat suppliers' monopoly position by regulating the supply of heat to small-scale users. Suppliers of heat (not just district heating) are required to arrange for reliable and affordable heat supply against reasonable conditions and good quality service. For this purpose, the Act introduced a license obligation for the supply of heat, as well as price regulation with a mandatory maximum tariff for supply of heat.

In order to reach the renewable energy targets, the Heat Act got a revision which entered into force on 1 January 2020, adding regulation on the sustainability of district heating. Currently, another bill to amend this act is already being prepared. This bill, which the Ministry of Economic Affairs and Climate calls the Wet Collectieve Warmtevoorziening (further referred to as Heat Act 2.0), anticipates the coming energy transition where heat networks are expected to play an increasingly important role. To facilitate decision-making and investment in the construction and operation of heat networks, the Ministry is using the Heat Act 2.0 to elaborate on the roles and responsibilities of public and private parties, and outline the prerequisites for creating a reliable, affordable and sustainable collective heat supply.

Unlike in Denmark, in the Netherlands there are no regulations on the legal entity that controls the heating company. At the moment the market is dominated by 5 actors. One is owned by municipalities, whereas the other four are private for-profit multinationals like Eneco and Vattenfal. The last proposals of the Heat Act 2.0 aim to make the district heating sector largely a public sector, but allowing public and private partnerships when the public entity has at least 51% of the shares. In the current proposals it also transposes the renewable energy Directive and takes up energy communities (warmtegemeenschappen) into law. These warmtegemeenschappen will get the same rights and obligations as district heating companies owned by public entities.

*Regulator*

The Authority for Consumers and Markets (ACM) functions as an autonomous administrative entity. The ACM operates under the national government, but retains its independent status, separate from any Ministry affiliations. In the formulation and announcement of decisions, the ACM adheres to the regulations outlined in the General Administrative Law Act (Awb). The primary mission of the ACM is to cultivate functional markets that benefit individuals and businesses. This is achieved by ensuring that companies adhere to established regulations and by preventing unjust practices, thereby fostering a level playing field. The ACM plays a pivotal role in disseminating information about these regulations, empowering everyone to uphold their rights.

The roles and responsibilities of the ACM encompass:

- Equipping consumers with information to assert their rights.
- Investigating potential instances of unfair practices. This involves the authority to access premises, request information, and obtain data.
- In cases where companies flout regulations, the ACM issues warnings and possesses legal authority to compel compliance, which may involve imposing financial penalties. These penalties are made public on the ACM's website. Additionally, the ACM can publicly caution consumers about companies engaging in unfair practices.

*Tariff regulation*

In the Netherlands the district heating prices can show variability across different district heating companies, yet they are all governed by the Heat Act. The foundation of district

heating lies in a local heat supply monopoly. Operating as a monopoly, it abides by the "Not-More-Than-Otherwise" principle (NMDA in Dutch), which mandates that prices remain below the cost that a gas user would pay for an equivalent amount of heat.

Annually, by the end of December, the ACM releases the maximum prices district heating companies are permitted to charge their customers for heat and cooling supply. Additionally, the ACM determines maximum rates for heat and cold measurement, connection and disconnection fees, as well as the highest permissible charges for heat delivery unit rentals. Various methodologies, as outlined in the Heat Act, are employed by the ACM to ascertain these maximum prices.

The tariff regulation is based on two components. The initial approach is the natural gas reference method. However, this maximum tariff can cause unreasonable profits for a district heating company. The ACM can do a test on the return on investment of the heating company. The Dutch government determined that this is undesirable and has therefore introduced a return test. If the company achieves a return that is higher as the "reasonable return" that the ACM has set, the ACM can correct this. This return is based on the weighted average costs and on data submitted by the district heat companies. In the Heat Act 2.0 it is proposed to decouple the link with natural gas and move toward a cost based tariff regulation with mandatory maximum tariffs per technology. The Ministry plans to make this transition in 10 years' time.

### Belgium (Flanders)

Every region in Belgium has its own regulatory framework. There is no federal legal framework - apart from one law concerning social tariffs for DH. In addition, the interviewed community energy projects are mostly in Flanders. This is the reason why the Belgian regulatory framework focuses on that specific region.

The regulatory framework for heating and cooling networks in Flanders largely follows from Title IV/1 of the Energy Decree[41], and the associated implementing provisions in the Energy Decree. The Decree regulates the basic operational activities of district heating and cooling projects.

[41] Decreet houdende algemene bepalingen betreffende het energiebeleid, 2009.

Unlike in Denmark, in Belgium there are no regulations on the legal entity that controls a H&C company. However, energy cooperatives can get the recognition of a social orientated cooperative (CVSO)[42]. A requirement for this is a maximum of 6% return for shareholders[43]. A CVSO receives financial benefits.[44] The cooperative entity, coöperatieve vennootschap (cv)/ la société coopérative (SC), has been redefined to encompass only the "true" cooperatives, i.e. cooperatives that have a social and cooperative approach aiming at the development of activities that have an economic and/or social impact for its cooperators, rather than a simple profit motive.[45, 46,]

*Regulator*

In Flanders, the Flemish Regulator (VREG) regulates the district heating sector. They are an independent public organisation that regulates, informs and advises parties in the energy sector.

*Tariff regulation*

In Flanders the tariffs of district heating and cooling are not regulated. In order to develop a district heating project, the company needs to convince participants to join. They often do this to link the prices of heat to the international gas prices. This creates an offer that promises not more than the fossil price. However, much like in the Netherlands, it was precisely this connection to gas that negatively affected consumers during the last energy crisis. It gave the district heating companies the right to triple their tariffs[47].

[42] Art 8:5 Wetboek van Vennootschappen en Verenigingen (WVV)

[43] Wet van 20 juli 1955 houdende instelling van een Nationale Raad voor Coöperatie, het Sociaal Ondernemerschap en de Landbouwonderneming

[44] https://seeds.law/nl/nieuws-inzichten/het-wvv-3-1-de-cooperatieve-vennootschap-cv-terugkeer-naar-de-eigenheid/#:~:text=Enkel%20CV's%20(en%20VZW's)%20kunnen,een%20%22erkende%20CVSO%22%20genoemd.

[45] https://economie.fgov.be/fr/themes/entreprises/creer-une-entreprise/demarches-pour-creer-une/formes-de-societes/les-societes-cooperatives

[46] https://justitie.belgium.be/nl/themas_en_dossiers/vennootschappen_verenigingen_en_stichtingen/vennootschappen/vennootschap_0

[47] *Tarieven warmtenetten verdrievoudingen bij Fluvius*, De Tijd, 2022.

## Italy

As analysed above, in countries like Belgium, the Netherlands, and Denmark the government makes the regulations and the Regulator uses its authority to enforce them. On the contrary, in Italy the regulatory Authority also drafts the bulk of the regulations for district heating and cooling. The aim of the regulations are mostly focussed on consumer protection, making sure there is sufficient transparency, but also information on what needs to be on the invoice, and between when H&C companies need to communicate changes in the conditions of the contract.

In Italy there are no regulations on what kind of legal entity the district heating needs to be. The fact that most district heating and cooling projects in Sud Tirol are led by energy communities is a consequence of historical factors. They are also recognised by the European Union as historical cooperatives, and were thus not forced to unbundle their activities.

*Regulator*

The Regulatory Authority for Energy, Networks, and the Environment (ARERA) undertakes regulatory and supervisory responsibilities across multiple sectors, including electricity, natural gas, water services, waste management, and district heating and cooling.

ARERA operates as an autonomous administrative body with a mission to foster competition and efficiency in public utility services. Its focus extends to safeguarding the interests of users and consumers. This role is fulfilled by aligning the financial objectives of service providers with broader societal goals, including environmental preservation and resource optimisation.

ARERA's functions encompass advisory and reporting duties toward both the Government and Parliament, specifically related to areas within its jurisdiction. This involvement extends to the formulation, incorporation, and execution of regulations originating from the European Union.

An interesting difference with the other countries is that the funding required for ARERA's operations is derived not from the state's budget, but from contributions sourced from the revenue generated by regulated operators.

*Tariff regulation*

In Italy the tariffs for consumers are not regulated. In Sud Tirol where almost all district heating and cooling projects are owned by the cooperative, this is an internal affair. There is a regulated protection fee. This fee is a cost for the consumer when they disconnect from the district heating project. The way this fee is calculated is regulated to make sure it only covers the cost of the connection.

## EU regulatory framework

There are several legislative acts at the EU level that include references to heating and cooling, although contrary to the electricity market, there is no overarching legislation for heating and cooling. The main EU document to inform thermal energy legislation is the European Commission's 2016 "EU Strategy on Heating and Cooling"[48] (referred to as the Strategy onwards).

The goal of a resilient energy Union as a climate policy dates back to 2015[49], and aims to create a market for "secure, sustainable, competitive and affordable energy". In this same communication, the Commission outlines its vision of a Union where energy is delivered to citizens in a secure way and "based on solidarity and trust" - these are values that energy communities embody. Furthermore, this principle of solidarity in energy matters is explicitly mentioned in the Treaty on the Functioning of the European Union, as the Commission says, it is "at the heart of the Energy Union".[50]

The Strategy focuses on building renovations, smart controls, decarbonisation of heating and cooling, and recovery of waste heat through district heating. These are all activities that energy communities are carrying out through citizen-led renovations and Community District Heating and Cooling, where citizens are owners of these projects in a spirit of solidarity. Indeed, the document concludes that citizens "must be at the centre of this strategy" to shift to a smart, efficient and sustainable heating and cooling system that can unlock savings for companies and citizens. Furthermore, the Strategy encourages an integrated approach to the energy system. As detailed in the "Technologies" section of

[48] COM(2016) 51 Final, 16.02.2016

[49] COM(2015) 80 Final, 25.02.2015

[50] C326/13, 26.10.2012

these Guidelines, district heating by its very nature has the greatest potential for integration of different thermal energy sources, ensuring a high level of energy security to its citizens.

Since the Strategy, heating and cooling has been continuously incorporated into different legal acts of the Union, mainly in the Renewable Energy Directive (RED), the Energy Efficiency Directive (EED) and the European Performance of Buildings Directive (EPBD):

### 1. Renewable Energy Directive (RED)

The RED focuses on requirements on identifying the potential of renewable heating and cooling, the decarbonisation of it, and on improving certification for installers of such systems.

The RED demands that Member States increase the share of renewables in the H&C sector by 1.1%/year until 2030[51]. It also includes an obligation to assess the potential of renewable H&C and waste heat, followed by an analysis of suitable areas to deploy it, including, where appropriate, "through district heating and cooling with a view of establishing a long-term national strategy to decarbonise heating and cooling". This must be done while ensuring their accessibility to all consumers, in particular those in vulnerable and low-income households.

The RED also deals specifically with district heating and cooling[52]. It establishes an increase in waste heat and cold recovery, and in district heating and cooling by 2.1%/year. In addition, Art.15a obliges Member States to introduce measures in their building regulations and support schemes with the aim of achieving a "substantial increase in renewable self-consumption, renewable energy communities and local energy storage". They are encouraged to reach these objectives through efficient district heating and cooling.

It also improves the training and certification of installers[53], whereas Annex IV lays out the criteria for certification of installers of H&C systems. To that end, Member States must ensure that qualified installers are available "in sufficient numbers (...) required to contribute to the annual increase" in RES in H&C.

### 2. Energy Efficiency Directive (EED)

[51] Article 23 RED II
[52] Article 24 RED II
[53] Article 18 RED II

The EED focuses on multiple aspects of heating and cooling, including energy audits[54], metering and sub-metering[55], billing[56], consumption information[57], and basic contractual rights[58].

The EED establishes the energy efficiency target[59], where Member States must collectively ensure an energy consumption reduction of 11.7% in 2030, "so that the Union's final energy consumption amounts to not more than 763 Mtoe". This means that while the final energy target is made binding, the primary energy target remains indicative. This is complemented with end-use energy saving targets per year, through an energy efficiency obligation scheme[60].

To achieve these obligations in energy savings, Member States must promote the role of energy communities in the contribution to these objectives[61]. Furthermore, in order to create guidelines to overcome split incentives between owners and tenants, Member States must support multilateral dialogues between relevant partners such as energy communities and local authorities[62].

Moreover, in the obligatory heating and cooling assessment that Member States have to submit to the Commission in their national energy and climate plans (NECPs), they must ensure that local and regional authorities prepare local H&C plans with populations higher than 45.000 citizens. These plans must assess the role of energy communities and other citizen-led activities that can contribute to the implementation of local heating and cooling projects.

### 3. European Performance of Buildings Directive (EPBD)

The buildings Directive, aiming to decarbonise our building stock (responsible for 36% of our GHG emissions), is being negotiated at the moment of publication of this report. Given the ongoing trilogues (negotiations between European Parliament, European Commission, and the European Council) it would be unwise to venture into conjecture.

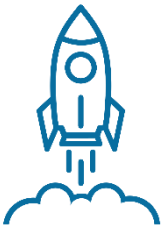
[54] Article 12 (EU) 2023/955 (recast)
[55] Articles 14 & 15 (EU) 2023/955 (recast)
[56] Article 18 (EU) 2023/955 (recast)
[57] Article 20 (EU) 2023/955 (recast)
[58] Article 21 (EU) 2023/955 (recast)
[59] Article 4 (EU) 2023/955 (recast)
[60] Article 8 (EU) 2023/955 (recast)
[61] Article 8.3 (EU) 2023/955 (recast)
[62] Article 22 (EU) 2023/955 (recast)

With that in mind, the proposal from the Commission did include references to citizen-led renovations and the role of energy communities in building renovations and their thermal energy systems. We hope that the negotiators will follow the thread of other energy legislation, and reinforce the role of energy communities and citizen ownership.

We also recommend reading the Recitals in the relevant legal acts of the Union, these are not legally binding, but they do offer an excellent background into the aims of the law, and can be a great source of clarification.

On a European level there need to be some basic guidelines on how to create accountancy rules on a National level to determine which companies comply with the not for profit rules.

## Starting your own CH&C project



The start of a district heating project can be different in every community. Either people want to make their house sustainable and realise it is more cost effective and sustainable to do this collectively in their neighbourhood, or in other cases the municipality is making plans to tender your neighbourhood to private parties and you decide with your community you want to keep control of your heating system. Whatever the reason, most projects start with nothing and need to build up an organisation from the bottom up. The process and methodology is extensively described in the SCCALE methodology guide[63] and the REScoop.eu Community Energy Guide[64].

### Finding peers

The first thing to do when starting a Community Heating and Cooling project is to find peers in your neighbourhood. People who are interested in renewable energy, or are also thinking of making their house sustainable. It is advised to find people with varied expertise in governance, finance, and renewable technology. Describe your vision for the future and the values you want to incorporate. Once you have this you can invite others from the neighbourhood to join your initiative based on these values. You do not have to know everything. The promise to the community is you are going to find out together, as decision-making and ownership are in the hands of the neighbourhood.

To find peers, one must first understand the contexts that usually lead to the creation of energy communities for heating and cooling[65];

- Limited heating and cooling needs for small, rural communities, which can often be satisfied by smaller projects.
- A lack of action by local authorities, as they themselves lack adequate human and financial resources.

[63] https://energycommunityplatform.eu/resources/the-sccale-methodology-guide/
[64] https://www.rescoop.eu/toolbox/community-energy-a-practical-guide-to-reclaiming-power

[65] '*Retour d'experience de chaleur territoriale renouvelable et citoyenne',* LIFE Let'sGo4Climate Project, 2023

- A lack of action by traditional market actors, given that these projects are not seen as lucrative enough, and risky.

These barriers often leave citizens unsatisfied, or even frustrated at the untapped potential of their thermal comfort. The creation of energy communities is therefore often a reaction to an unsatisfied need by the population, who prefer to 'do' rather than 'sensibilise'. These new market actors therefore grow out of 'social innovation', and with an objective to develop an activity that seeks social and collective benefits, rather than financial gain.

The reasons for joining an energy community are nevertheless as diverse as our societies themselves. For instance, in Denmark and Italy (Süd Tirol) there are cultural and historical factors at play that encourage citizen participation.[66] At any rate, Community district heating is widespread in Denmark, where out of 385 district heating projects, 323 are cooperatives (49 are municipally-owned, and only 13 are owned by for-profit market actors).[67]

Indeed, the European Commission found in its meta-study that the decision to switch to renewable heating and cooling is not triggered by profit orientation alone, but by "striving for well-being that is contingent on self-centered interests (desires) and altruistic aspects". Therefore, while a solid financial plan is key for any citizen-owned H&C project, participation in it goes far beyond monetary issues. Energy communities would be wise to use this knowledge to attract new members.

In addition, according to Beauvent, there are some things that can help you increase the trust that people have in your project. They recommend to have a trust-based relationship with the local government, and a good team of enthusiastic members. That being said, they also emphasised the importance of having someone with financial knowledge, since "we are talking about raising and investing citizen's funds, so you need to know what you are talking about".

It is also advisable to make a connection with other energy communities in your region or country[68], or even in Europe through the European federation of citizen cooperative

[66] '*Cooperative District Heating in the making*', Energie Samen & EBO Consult, 2022

[67] Danish Utility Regulator, *Fjernvarmestatistikken* (2019), p.13

[68] https://energy-communities-repository.ec.europa.eu/index_en

REScoop.eu. Sharing knowledge and helping each other will not only strengthen your project, but also the energy communities in your region or country.

## Examples from Member States

**Netherlands** - The local initiative "50 shades of Green" grew to a significant number of members in a short period of time. They started with kitchen table meetings, not only to talk about energy, but anything that people were concerned, happy or frustrated about. They grew out to an initiative that covers all kind of sustainability projects for the neighbourhood. Once they reached a strong following, they moved to bigger projects. They are now in the early stage of development for a community-owned district heating and cooling network in their street.

**France** - the cooperative ERE43[69] started off as an association for the promotion of renewables. As they themselves state, they saw themselves as "global citizens of the world who want to play their part in the energy transition through the sun, wind, and wood energy sources present in Haute-Loire." In 2007 this group of varied citizens (farmers, teachers…) with a concern for their community decided to move from advice, to action, and created their own cooperative to produce biomass.

## Neighbourhood approach

The premise of the approach is that you start small with a group of neighbours and collectively make plans. This input can range from decision making in a general assembly to concrete expertise in working groups and as board members. It then continues to move from an initiative into a collectively owned company that can attract financing and organises the professionality to manage the district heating network.

[69] https://www.ere43.fr

Community Heating and Cooling operators are active in limited areas, rarely passing beyond several dozens of Kilometres from their headquarters[70]This geographical proximity can be explained by the willingness of its participating citizens to focus on local added-value, and to remain close to where they live and work. In addition, membership to a Community Heating and Cooling network is also dependent on 'social proximity', as many members join once they see that their neighbours are active in it.

In the Netherlands the Dutch district heating cooperatives specifically focus on the neighbourhood approach. The initiative of citizens often starts with the ambition of the local municipality to transfer that neighbourhood from natural gas to a renewable heat source. Knowing this will have a great impact on citizens, and encourage them to start organising themselves.

Throughout the process the energy community builds up social acceptance for the plans. The aim is that all interests and concerns are addressed throughout the process.

## Package approach

The package approach is focussed on getting people involved with as few contact points as necessary to create a service to connect people with as little hassle as possible. The two approaches do not exclude each other. The first is to create social acceptance for RES H&C, the other to create a pleasant customer experience.

In Denmark, EBO Consult manages administrative and technical tasks of several local district heating non-profit companies, called Hvidovre Fjernvarme, FDHvidovre, and Avedøre. Each company is a cooperative owned and directed by citizens and consumers. EBO consult uses what is called the package approach.

First there is a marketing period where a specific area is targeted. Which area is next, is determined in advance in a district heating expansion plan. In order to begin, a project proposal must be prepared and sent to the municipality for approval. It must include socio-economic, user-economic, environmental analyses of different heating sources

[70] '*Retour d'experience de chaleur territoriale renouvelable et citoyenne',* LIFE Let'sGo4Climate Project, 2023

(district heating, oil or gas). The city council is obliged to approve the heating source that has the largest socio-economic benefits.

Consequently for a period of 2-4 months the cooperative goes into the area, starting off with newspaper articles and information nights. People can sign up to participate on the website of the cooperative. The marketing in this campaign has three main arguments: comfort, price, and sustainability. When 30% of the district households sign up, the project goes ahead. There is a specific deadline for people to sign up. When the customer agrees on the details, he or she signs a contract with the cooperative. Everybody that signs up gets a visit from the account manager of the cooperative. This person explains all the details on how, when and where the installations will be installed. This account manager communicates with the cooperative, the builders, and construction workers, the customer only needs to be home when they start the installation.

Customers only have to do two actions. Sign the contract and open their house for the installation. All the rest is taken care of by the cooperative. Customers can become a member of the cooperative (non-profit organisation in Denmark). After the installation members get information on saving energy. Since returns on investment come through lower heating prices, it is in their interest to save heat.

## Finding Stakeholders

Energy communities are built around the concept of partnership, bringing together people and organisations with differing expertise and interests into a common project. There are always founders that give the project the first impulse and brings together different members, such as social organisations, heating engineers, producers of renewable energy (e.g. industrial waste-heat, geothermal plant, solar thermal installation…), public actors such as the local government that help with financial and/or administrative tasks, small businesses, investors, and of course citizens.

Below we will delve into each of these stakeholders, the different roles that they play across the EU, and the added value of their inclusion.

At any rate, as soon as you have a small, citizen-led initiative it is advised to involve your municipality. Below you can find what kind of roles a municipality can take. In this stage it

is important to get the municipality on board to facilitate your initiative, with help from expert civil servants, or some subsidy to make some technical analysis or as a partner in the whole process. Often there is local climate policy, it is important to connect to that policy. Be very clear about what is expected and create a Memorandum of Understanding with your municipality, this is especially relevant for H&C projects, given the monopoly of heat. In Italy - in the Süd Tirol region - the municipalities are small and often lack capacity. The local cooperatives there try to take up a much more active role and try to help their municipalities in their role.

### 1. Municipalities

The role of municipalities is crucial for the development of Community Heating and Cooling. The municipality can take many different roles in the development and exploitation of the H&C project. In the first place the municipality is the authority that is responsible for the local plans and permits. In Denmark this role is enshrined in law. The Heat Supply Act makes it the responsibility of the municipality to make a heating plan for neighbourhoods. This created the political and regulatory framework needed for the support for district heating[71]. If you want to learn more about the relationship between municipalities and energy communities please read the Community Energy Municipal Guide[72] by REScoop.eu & Energy Cities (2022). For more information on capacity building, kindly refer to the Energy Community Platform[73].

- **Municipality as customer:** Next to being a governmental authority, a municipality can be an important consumer of heating and cooling too. A municipality often owns various buildings, such as schools, hospitals, municipal offices, and other types of public services. In the early stages of H&C projects, they can be the first customers, and an important partner to supply H&C to. It's important to note that the role of a municipality as a customer is a different role than being part of the energy community. In many cases, especially in cities, the role of the municipality as a customer is a completely different department than the civil servants you talk to in the development of the project. This department will require different arguments and information. You should approach them like any other customer.

[71] EBO Consult & Energie Samen, 2022

[72] https://www.sccale203050.eu/toolkit/

[73] https://energycommunityplatform.eu/

The energy cooperative Beauvent in Ostend (Belgium) had the town hall as one of their first H&C customers. The fossil central heating (i.e. gas) became obsolete for the whole building. Beauvent then took over the gas boiler from the municipality and used it as a backup in their system, to ensure a supply of heat if something were to go wrong. They plan to phase out this fossil back-up in the coming years.

- **Municipality as part of the energy community:** In those cases where the Municipality is more invested in the community, or responsible for the permits, they often become part of the energy community.

  In Denmark for example, representatives from the municipalities sometimes sit on the board of directors of the energy community, participating in the development of the district heating network. In Hvidovre, 1 or 2 representatives from the municipality sit in the board of directors, because the district heating cooperative has municipal guaranteed loans. The participation in the board of directors enables the municipality to also have influence over the day-to-day operation, and the long-term strategic planning.

  When a cooperative initiative in Denmark wants to set up a heat supply, it submits a project proposal to the municipality to obtain the necessary permits. This is done prior to submitting an application for financing. The project proposal must comply with the guidelines prepared by the Danish Energy Agency. These guidelines outline a socio-economic assessment framework with which project proposals can be drawn up and assessed. Standardisation thus makes it easier for initiatives to prepare a proposal and makes it easier for municipalities to assess them. When a project proposal scores better on the socio-economic criteria than possible alternatives, the municipality is obliged to grant the initiative a concession for implementation[74].

### 2. Housing organisations

Housing organisations are important stakeholders in the development of Community Heating and Cooling. Like municipalities, they often own large buildings in the area that need to be connected. Therefore they are important partners in the development of a district heating and cooling plan. It is an effective way to retrofit their housing portfolio.

[74] Handleiding financieringaanvrag cooperatieve warmte, Energie Samen et al, 2021.

In many cases a Community district heating network is a real benefit for social housing organisations. If the houses needed to be completely insulated with separate heat pumps, it would cost them more and they would need to organise the transition themselves. It is therefore important to make a Memorandum of Understanding with a social organisation that sets out how they will be involved in the project. This also encourages community-building at a local scale.

Alas, it is important to remember that citizens must be at the centre of decision-making, as the case of the Netherlands clearly showed: To get the district heating sector off the ground, the Dutch Government brought together 36 housing companies, 5 for-profit district heating companies, tenant's associations, the central government, and municipalities  The project aimed to start with the low hanging fruit. These were the neighbourhoods where the majority of apartments were social housing. The agreement between the municipality, housing corporations, and the heat companies could be made very easily, covering a large amount of houses to connect to the district heating project. In many neighbourhoods however, the individual citizens were not included in the deal, or sometimes not even informed about it. The consequence for them was that they would become a customer of a district heating company they did not choose. In several neighbourhoods this led to opposition of several citizens, slowing down the process, or even abandoning the plans altogether in some cases. The Dutch experiment is thus a good example of a bad practice, warning us that building a H&C network without directly involving the citizens can have negative effects on the green transition.

On the other hand, the Danish case of the Avedore Green City[75] brought together 9 partners to develop Avedore Green City into a sustainable project, given the need for building renovations and the installation of renewable H&C. The project included public housing organisations, the municipality, and the local heating cooperative, which meant that citizens had a direct say over how to organise their neighbourhood's transition. Contrary to the for-profit Dutch case, instead of slowing the transition, the Avedore Green City's two original projects have today grown to 9 projects (with more on the way), and invested over €60 million in citizen-led renovation projects, supply of H&C, mobility solutions, and biodiversity restoration. This experiment thus shows that involving citizens

[75] https://www.avedøregreencity.dk/

in the process increases the chances of success, as well as expands the number of environmental projects.

### 3. Small and Medium Enterprises (SMEs)

SME's are also important stakeholders in the development of community district heating and cooling projects. Firstly because SME's in the region are often large users of H&C, especially compared to individual citizens. Secondly, because their energy use is different than a citizen's. SME's businesses are often reliant on a stable and trustworthy energy supply. When the energy flow stops for a day in a household it's a nuisance. If it stops in a hospital or hotel it is disastrous for that actor.

To start their project, the Belgian energy community Beauvent started with only local industrial SME's near the heat source. Their project was viable with only 9 local industrial clients because of the volume of heat they would consume. From there on they could expand to apartment buildings and public buildings. They are now in the process of expanding to individual households.

## Governance

Energy communities are different all over Europe because they function in different legal contexts and exist for different needs of their members, but there are many characteristics that they share. The main one being the energy community's desire to share decision-making between their stakeholders (citizens, municipalities, and SMEs) on a foundation of transparency and democratisation.

The decision-making body of energy communities (the general assembly) are cooperative in nature, where collegiality and the one-person-one-vote principle are key cornerstones. Usually, the energy community is split into two more sections: a political and an operational one[76]. While the "political" section includes the board of directors, and sometimes also ethics committees, the "operational" section includes the practical administration of the energy community's H&C activities. It is not uncommon to see shorter-lived sections that deal with specific concerns, such as Committees. That being

[76] *Retour d'experience de chaleur territoriale renouvelable et citoyenne',* LIFE Let'sGo4Climate Project, 2023

said, there concept oftentimes overlap, in any case there is always an Annual General Assembly for members to make decisions, and an elected Board of Directors.

The governance of energy communities is best illustrated by the French sociologist Henri Desroche in his "quadrilatere cooperatif" of the early 1900s:

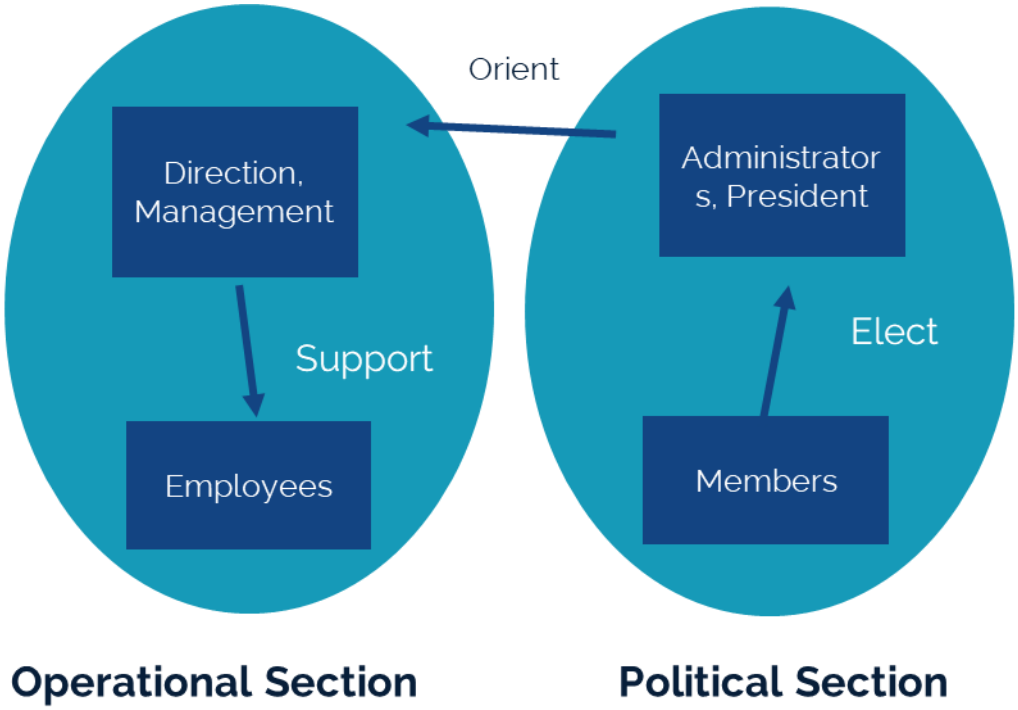



*Figure 4 - quadrilatere cooperatif" by Henri Desroche*

As is often the case, cooperation is bottom-up, rather than top-down. It cannot be decreed, but rather built step by step; Oftentimes the initiative starts from a "founder" (or founders) who try to bring together several citizens, municipalities, and SMEs into the notion of shared governance. There exist certain risks after the first few years, such as cooperative decline, where economic issues take an increasing dominance over political ones (known as vertical fracture), or an increasing dominance of managers over the members and operational base (known as horizontal fracture). There is also the risk of project legacy when passing the project beyond the founder(s), which may change the economic and political reality of the energy community.

These are all risks that citizens should think about when developing the governance of their energy community project. That being said, the European Commission finds that "a

polycentric governance approach to heat planning (involving a wider range of stakeholders, including municipalities and citizens) is beneficial if it happens simultaneously to the design and transformation of heating systems"[77]. To paraphrase, in its meta-study, the Commission found that democratic approaches to heating and cooling bring positive results.

### 7 cooperative principles

Another commonality between them are the fact that most organise themselves along the 7 cooperative principles:

1. **Voluntary and Open Membership**: Cooperatives are voluntary organisations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political or religious discrimination.
2. **Democratic Member Control**: Cooperatives are democratic organisations controlled by their members, who actively participate in setting policies and making decisions. The elected representatives are accountable to the membership. In primary cooperatives, members have equal voting rights (one member, one vote).
3. **Members' Economic Participation**: Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following 4 purposes: developing the cooperative, possibly by setting up reserves, part of which at least would be indivisible; benefitting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.
4. **Autonomy and Independence:** Cooperatives are autonomous, self-help organisations controlled by their members. If they enter into agreements with other organisations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.
5. **Education, Training, and Information**: Cooperatives provide education and training for their members, elected representatives, managers and employees so they can

[77] European Commission, *Overview of Heating and Cooling: Perceptions, markets and regulatory frameworks for decarbonisation,* 2022.

contribute effectively to the development of their cooperatives. They inform the general public, particularly young people and opinion leaders, about the nature and benefits of cooperation.

6. **Cooperation Among Cooperatives**: Cooperatives serve their members most effectively and strengthen the cooperative movement by working together through local, regional, national, and international structures.
7. **Concern for Community**: While focusing on member needs, cooperatives work for the sustainable development of their communities through policies accepted by their members.

## Development process of a CH&C governance model

A community heating and cooling (CH&C) network creates connections between producers and consumers of thermal energy around an ethical, solidary, and social economy. The purpose of CH&C is to facilitate citizens, municipalities, and small businesses thermal energy for a democratic, transparent, and affordable price.

For the system to ensure these prices, it must have a governance model that allows citizens to control the price of production in full transparency.[78]

The energy community that exploits these thermal installations must also have a not-for-profit objective, seeking instead the fulfilment of social and environmental criteria as established in the EU definitions for energy communities. The ultimate objective of a Community Heating and Cooling network is to democratise thermal energy by putting production and/or distribution capacities in the hands of the participating citizens.

Alas, while the same governance system of citizen control has allowed PV and wind communities to thrive across the EU, heating and cooling systems are not as common, in most countries despite their potential. For instance, in France in 2022, the national federation of energy communities Energie Partagee[79] found that out of their 178 citizen-led RES projects, only 8 were thermal energy projects, these represent 12.7MW. Yet the fact that nearly half of our energy consumption is heating and cooling, and that nearly 80% of heating comes from fossil fuels, tells us that this number of community projects is

[78] 'Chaleur Renouvelable Citoyenne - Etat des lieux et propositions', LIFE Let'sGo4Climate Project, 2022.
[79] https://energie-partagee.org/

inadequate for France's thermal needs. Especially considering that France's renewable heat is expected to increase by 28% between 2020 and 2023[80].

Even though the governance systems between wind and solar cooperatives are similar, the development process of district heating and cooling projects are a lot more elaborate. With the development of wind and solar one doesn't need to involve every household. With the development process of DHC one does. This is the main reason why many private parties get stuck during this development, the involvement is in most cases impossible to organise with only marketing and external consultants. The community energy governance model facilitates this elaborate participation process for several reasons.

First, the cooperative governance model stimulates active participation. If the citizens in the neighbourhood are the owner of the company they need to be involved in the decision making during the process. This active participation is the key success in creating social acceptance for the plans, because the interests of citizens and homeowners are heard and taken into account. For instance in ESEK's (Greece) case, the Management Board provides the most volunteer time to coordinate the operation of the biomass plant. They do this by organising one Board meeting per week on average.

Second, citizens own the company and are directly involved and have an interest in its success. In most cases volunteers offer to be ambassadors for the project and help get more members, or bring in their own expertise to support the company in the early stages of development.

Finally, local citizens are experts about their own houses and neighbourhoods. By involving them directly in the decision making for the plans they can bring in local expertise, improving the plans even on small details, whereas external consultants would not have known these details and would therefore be ignored.

[80] '*Strategie Francaise pour l'energie et le climat 2019-2023'*, Ministere de la Transition Ecologique et Solidaire.

## Governance models in cooperation with other stakeholders

### Multi Stakeholder cooperative model

In the development of DHC it is important to involve the most important stakeholders. One way to do this is to create a multi stakeholder cooperative model. This way the stakeholders are not only customers but also co-owner of the company and more invested in the decision making of the company and have a collective responsibility for the operation of the district heating network.

For example the cooperative FD Hvidovre is an example of how a district heating cooperative is organised and includes all important stakeholders. The board of representatives in FD Hvidovre is divided into 6 groups: 1. the municipality, 2. larger housing associations, 3. smaller housing associations, 4. larger private properties, 5. businesses, and 6. households. Decision making is accomplished through a majority of votes. Every cooperative member has several votes based on the registered properties/business/leasing agreements connected to the district heating grid. The board of directors are elected at the meeting of the representatives. In other cases, like in Italy all shareholders are just considered part of the community and all natural and legal entities can become a member and have one vote in the general assembly.

In the case of ESEK (Greece), the cooperative Bank of Karditsa is also a member of the energy community, and in turn ESEK is a member of the cooperative bank. In addition to several municipalities in the region, the municipal development agency is also a member of ESEK. This participation has proven very useful, as it adds administrative know-how to the energy community.

In the case of Energent (Belgium), the cooperative decided to connect their community heating and cooling system to housing projects. In addition to democratising the housing project's thermal energy supply, this also helped Energent to get assurance from the local municipality that they would not have to relocate in the near future. Therefore, Energent has a contract with the housing association to manage their heating and cooling system for 10 to 20 years. After this time, the members have the option to become owners of the H&C system, or to renegotiate a new contract with Energent. This nevertheless required a considerable amount of studies and measurements to make sure that the residual heat can satisfy the thermal needs of the citizens connected to it.

### Cooperative model with shared limited entities

A different form to work together with other partners is through organising collectively joint ventures. This is often the case when energy communities work together with companies that are strategic suppliers of expertise or capital.

In Amsterdam the cooperative MeerEnergie U.A. works together with the regional DSO. Due to Dutch regulation the DSO can only invest in infrastructure networks. For that reason they will set up a joint venture in a limited entity where the cooperative owns 51% of the shares and the DSO owns 49% of the shares. They both put up the capital to the ratio of shares.

### Shared service companies

Shared service companies are companies either owned by a group of cooperatives themselves, or consultancy companies that work in very close relationships with a group of cooperatives. By sharing services cooperatives do not have to organise everything by themselves. They pool the knowledge and expertise needed to run the cooperatives into one organisation. For 5 cooperatives in the same region it is not needed to have 5 different bookkeepers, with 5 different systems or membership support systems, or 5 different teams of technicians. They can organise efficiency by working together.

Member States such as Denmark and Italy (Sud Tirol) are being supported by shared service companies. The companies exist to support the H&C cooperatives. This can range to full service doing the invoicing, (financial) administration, communication, and technical planning and support. In Italy for example there is the Sud Tiroler Energy Verband (SEV). This is a cooperation of all the energy communities in the Sud Tirol region. They help energy communities with legal questions and for the representation at the national level. When there are changes they train their members on how to operationalise these changes into their organisation.

In Denmark, the day-to-day operations of FD Hvidovre (and three additional district heating and cooling cooperatives in Hvidovre) are overseen by EBO Consult. Within this context, district heating and cooling cooperatives have the option to opt for full or partial management by EBO Consult. In the event of full management, EBO Consult assumes responsibility for all tasks associated with the cooperative. These tasks encompass administrative, financial, operational, communicative, and project-related activities.

Alternatively, if a district heating cooperative chooses partial management, EBO Consult assists with specific tasks. Acting as an intermediary, EBO Consult bridges the gap between the board of directors and consumers.

While the board of directors delineates the strategic direction and engages in general decision-making for the cooperative, it is EBO Consult that translates these plans into action. These shared services supplants the conventional district heating cooperative model, which maintains its own staff. This approach empowers the board of directors to delegate tasks linked to personnel responsibilities and concentrate on the broader strategic trajectory.

### Gender balance in citizen-led projects

Ensuring a gender-balanced and just approach to the governance of Community Heating and Cooling actors is key to ensure that the transition leaves no one behind, it has furthermore also practical advantages to the operation of a project. As President Ursula von der Leyen put it, "in business, politics and society as a whole, we can only reach our full potential if we use all of our talent and diversity. Using only half of the population, half of the ideas or half of the energy is not good enough".[81]

Beyond the ethical nature of gender-balance, studies have shown that projects that take gender issues into account are more likely to achieve their objectives, compared to projects that do not. Research has identified the following improvements:

- New perspectives are added to the workplace
- Overall communication is improved
- Working conditions for men and women improve. This is corroborated by a 2019 analysis by IRENA (2019).[82]
- Achievement of better financial results[83]

[81] https://ec.europa.eu/commission/presscorner/detail/en/ip_20_358

[82] https://www.irena.org/publications/2019/Jan/Renewable-Energy-A-Gender-Perspective

[83] Noland et al, 2016, *Is gender diversity profitable? Evidence from a global survey.*

Indeed, as Oparaocha and Dutta (2011) put it, "when the gender situation is assessed and gender-needs are taken into account, projects tend to have a better impact on the ground"[84]. The question now remains: how does the energy sector and citizen-driven projects fare in terms of gender parity?

While representation of women in the renewables sector is better than in the fossil fuel industry, we need to continue applying ourselves to achieve parity in the workplace. Women represent 32% of the renewables workforce, compared to 22% of the oil and gas industry[85]. When it comes to energy communities, this number is lower, reaching 20% in Germany and 29.6% in Austria[86] - this is a surprising finding since energy communities, by acknowledging their own challenges and embracing diversity, can democratise, decentralise, and diversify the energy sector.

Indeed, the nature of renewable energy cooperatives - especially their common 7 cooperative principles as established by the International Cooperative Alliance[87] - open the door wide open for a gender-focused approach to governance. The first 3 principles are especially relevant for this aim:

1) **Voluntary and open membership:** Emphasising this point, and making an effort to attract a diverse membership base is a great way to ensure that the energy community's decisions are inclusive and representative.
2) **Democratic member control:** The one-person-one-vote principle balances decision-making and, contrary to traditional market actors, avoids that a minority of people take unrepresentative decisions that affect all members.
3) **Education, training, and information:** Self-empowerment through the sharing of experiences and knowledge is a key building block in the road to gender balance.

[84] *Gender and Energy for Sustainable Development,* Oparaocha & Dutta, 2011.

[85] https://www.globalwomennet.org/engendering-the-energy-transition/

[86] Yildiz et al, 2015, *Renewable energy cooperatives as gatekeepers or facilitators?*

[87] https://www.ica.coop/en/cooperatives/cooperative-identity

Nevertheless, let us go beyond theoretical exercises and take a look at the practice. Below you will find a short list of inspiring practices that energy communities have put in place across the EU to narrow the gap between vulnerable groups. This is followed by some recommendations that other energy communities can put into practice. For a more detailed view, we recommend to visit the SCCALE Inclusivity Guide (2023), or the European Institute for Gender Equality[88], which offers a rich treasure trove of resources to make your energy community more inclusive and just.

## Bündnis Bürgerenergie e.V.

***Germany***

BBEn's efforts are around increasing visibility for women in the renewable sector. They do so by putting women to the front as organisers and speakers in events, and creating visual identities in their communications that represent women and vulnerable groups. In addition to this, they also make sure that the timing of their activities is adapted to parents with children, and therefore does not interfere with family time.


*Image 3 - So funktioniert die dezentrale Energiewende (c) BBEn, 2020.*

[88] https://eige.europa.eu/publications-resources/toolkits-guides

**Electra Energy Cooperative**

***Greece***

Electra decided to set their gender-balanced approach in stone, by referencing gender equality as a main mission in their statutes.

"*In particular, the Cooperative in the context of promoting sustainable development will carry out activities which:*

- *Promote the sustainability of the environment*
- *Contribute to social and economic equality*
- *Promote gender equality*
- *Protect and develop common goods"*

**Goiener**

***Spain***

Growing at a rate of 1.500 members/year, Goiener has paid special attention to gender balance in their workforce and membership. Out of their 53 employees, 27 are male, and 26 are female. A similar distribution can be seen in their membership base, where 55% are male and 45% are female. That being said, they have observed that more RES generation and volunteering is done by men than women.

In addition to this, Goiener has created a gender plan with the support of the Basque Country. The plan includes *"changing the discourse, assessing overall equity and treatment, a communications training programme, mapping and controlling participation during meetings, and setting up meetings taking into account the needs of parents with children"*.

**REScoop.eu**

**European Union**

The European federation of citizen energy cooperatives has a gender-balanced staff, and gender parity in their management. This was achieved by systematically appointing two natural persons of different gender as representative and deputy of the federation. In addition to this, REScoop.eu has established a Gender Equality Working group, and has recurrent internal discussions on how to ensure a gender-balanced approach to our work-life.

As it has been shown, there are different approaches that energy communities are taking across the EU to create a more inclusive and just environment for all. It must be noted that due to the human brain's recognition of patterns, coupled with cultural diversities in our societies, it is impossible to remove *all bias*. That being said, there are indeed many steps that can be taken to minimise the gap between people from different genders. Below are some recommendations of policies and practicalities that can be implemented to narrow this gap:

- Ensure full equality in salaries, promotions, and enforce a zero tolerance policy towards violence and sexual harassment. Som Energia[89] (Spain) has for instance introduced "Punt Lila"[90] as an attention point for assaults.
- Carry out gender assessments, to identify how policy affects men and women differentially, given their different roles in families and their status in the economy[91]. These assessments are essential to construct gender-sensitive frameworks, and incentivise gender equity to increase gender equality. It is recommended to put together a team of interested people to carry out the assessment, including a human resource officer, a gender specialist (if possible), and a diversity of people in terms of function and their intersectional identities (e.g. age, ethnicity, religion, gender identity, sexual orientation, educational background…).

[89] https://www.somenergia.coop/
[90] https://www.diba.cat/es/web/politiques-igualtat/punt-lila

[91] https://www.irena.org/publications/2019/Jan/Renewable-Energy-A-Gender-Perspective

- Consider creating a Gender Action Plan (GAP). Rather than a "one-off", the important thing is that the GAP becomes a living and practical document. Include steps to define gender goals and objectives, outline actions needed to achieve it, identify a timeframe and responsibilities, and agree on monitoring and evaluation. The EU gives a good GAP Guidance for Horizon Europe (European Commission & Directorate-General for Research and Innovation, 2021)[92].

## First Finances

For starting initiatives it is always hard to find the first finances. The most common place to go to is to find local municipal subsidies or regional funds. Most organisations start with social capital (i.e. volunteer work). Others manage to get social dividends from local cooperative banks to start their activities. The first finances are used for setting up the organisation, making the first communication (website, leaflets), and studying the technical viability of the plan.

The Dutch district heating cooperative MeerEnergie U.A.[93] started in 2016 with plans to connect the local data centre to supply heat to a neighbourhood in Amsterdam. The plan was at a very early stage and there was a small group of enthusiastic board members. They set up the cooperative and got a small grant of €20.000 to find more members and make a first technical analysis. They started cooperating with the locals who had this technical knowledge. They grew in that process to about 200 members. They then applied for a grant from the municipality for sustainable initiatives. They received another €50.000 to set up a process with their members to create a business case, an organisational plan, and a technical plan. They did this in several working groups with members and external experts. By the end of the process, they grew to 500 members from the neighbourhood. The plan was well received by the municipality and they continued with a new grant of €150.000 to fill in the details of the plan, going into houses for technical details, calculated with specific numbers in the business case, and set up contracts with future partners for the organisation. They are now in the process of getting the investment from the

[92] https://op.europa.eu/en/publication-detail/-/publication/ffcb06c3-200a-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-232129669
[93] https://meerenergie.amsterdam/

municipality of Amsterdam to execute this plan with the aim to build their Community district heating project in 2026.

The Belgian energy community Beauvent, has access to financing through bank loans, boasting 15 active credit lines, in addition to generating revenue from its membership. Impressively, they raised approximately €1 million from their members in just 30 minutes. However, this achievement is only possible because Beauvent has already established a robust business case and, over time, has garnered the trust of the local community. In Beauvent's own words, 'we are fortunate to have built a strong track record.' Nonetheless, to attain this level of success, conducting an initial technical analysis of your energy community and its surrounding environment is crucial.

The Dutch energy community, Thermobello[94], purchased their district heating network from a water company that had little interest in maintaining it. They raised the necessary funds through member crowd-funding and secured bank loans with municipal guarantees, which took a year but greatly facilitated the process. The loan was paid off in eight years, making Thermobello debt-free by 2019. This financial stability allowed them to fully renovate their heat pump for around €500,000 (see 'Technologies'). They anticipate the technology will remain viable for at least 15 years before considering a replacement.

**First Technical Analysis**

In the starting phase of your initiative you need to convince your neighbours to join your initiative. Indeed, as Beauvent said "building a network of people that trust you is the hardest part." The promise is that they will get involved in all major decisions. However, to get started you need to have a certain technical direction. It is therefore necessary to make a first technical analysis of the area. Are there enough heat sources, are maybe individual solutions a better option for the houses, what is the right technology or combination of technologies to heat the houses in the neighbourhood in relation to affordability for the consumer? These are all relevant questions.

Every citizen's initiative in the heat transition wants a good and affordable heat solution. That is why in the first steps you want to make an inventory of the technical possibilities. In

[94] https://www.thermobello.nl/

this step, the 'possibilities' are still ripe and green, because local residents have not yet been informed and formulated criteria to be able to choose from the various options. This inventory results in a long list of locally available H&C solutions (for more information, see "Technologies"). In some cases the municipality already has plans based on their transition policies. For example in The Netherlands, the municipality needs to make a Heat Transition Vision for every neighbourhood. This is an important input for this global H&C scan. As residents, you can further investigate whether there are local heating and cooling sources. Think of aquathermal energy, residual heat, or options for solar heat. If there is no local heat source, individual heat pumps are usually one of the possible scenarios.

The global H&C scan provides a first insight into the possible future H&C systems of the neighbourhood. You will likely not be the first to do such a scan in your country. Try to find other energy communities or municipalities that are willing to share knowledge. In the Netherlands the National government invested in a Start Analysis tool[95] which can be used as a technical-economic analysis, which provides an initial insight into the technical-economic and sustainability consequences of the H&C systems. Not all possibilities are included in that scan, so always keep an open mind for other possibilities.

Beauvent (Belgium) followed this logic by focusing at first on customer contracts, and identifying heavy heat users (e.g. high-rise apartments, hospitals, schools, or industrial sites) in order to develop a strong business case to access financing. Today, they have worked with more than 100 companies and governments, who they carefully choose based on shared social and environmental concerns. As Beauvent said, the main reasons that people have joined their energy community is the cost and purpose of Beauvent, the financial return above market, and the fact that they have very open communication and transparency towards their members and community.

EcoPower's[96] (Belgium) main H&C contract is to supply a camera-film making company with the necessary heating needs. They do this by reutilising the heat that comes out of the company's own chemical processes, and redirecting it back into the company in a fully circular H&C process. The company's previous thermal energy came from a gas boiler attached to its production plant. Ecopower replaced this boiler for a connection to their Community district heating and cooling system utilising waste heat. Ecopower did this, as the company did not see an economic case for such a replacement. The rest of the energy

[95] https://www.expertisecentrumwarmte.nl/themas/de+leidraad/startanalyse/default.aspx
[96] https://www.ecopower.be/

community's waste heat is supplied to local SMEs and households. This is yet another example where energy communities took over the environmental transformation that traditional market actors did not find financially attractive. In the words of Ecopower "gas created war, and disrupts our economies, so we must have a long-term view - solar heating in Belgium was considered ridiculous, now it's a reality".

Energent[97] (Belgium) also has a heating and cooling project based on industrial residual heat from a company that produces soaps and detergents. As they started their collaboration, 7% of the company in question was purchased by the cooperators of Energent. From this waste heat, they offer renewable H&C to 400 dwellings, with plans to expand this further. The total cost of this project was €1.2 million, with €400.000 given by the cooperative.

**First Business Model**

The establishment of solid own financial resources and a strong business case are an absolute necessity for the development of citizen-owned heating and cooling projects, this is especially important if part of the project funding is coming from banks (be it traditional or cooperative ones).

Financial resources come from capital contributions (e.g. shares) from members/shareholders who are involved in the projects, these are usually local authorities, citizens, key partners or supporters. Many energy community projects are based on direct citizen financing, or through national federations of energy communities.

In addition to long-term financing, energy communities have significant short-term cash requirements to cover the cost of waiting for subsidies, payment on accounts for the project's works, and the generation of renewable heat and cooling. These needs are

[97] https://energent.be/

generally covered by equity and quasi-equity or in many cases with volunteer work of members.

> *You learn a lot from your first citizen project, both from a technical and business-model perspective.'*
>
> Energent, Belgium

## Financial and business models

In general the business models for CH&C are all the same. With the equity of members mostly combined with bank loans. The energy community calculates all the cost including the depreciation and reflects this in the tariffs for the customer. The main risk is in the development of the project, but overall the income of district heating and cooling is very stable (everybody needs thermal comfort). Combined with the controlled ownership that can regulate the tariffs if necessary, there is little financial risk once the project is operating.

In general, DHC systems are only economically viable if the combined cost of centralised heat supply and the transmission and distribution network is less than the cost of individual heat supply. One must of course take into account that the heat demand will likely decrease as we increase the efficiency of our buildings. Energy communities would be wise to take this into account when developing their business models.

Regarding funding, according to the European Commission the 3 most frequent support schemes for district heating and cooling infrastructure are public funding and tax mechanisms, tariffs and premiums, and grants.

In the Netherlands there is a combination of all three support schemes to get the district heating sector off the ground. To start multiple pilot sites, the Dutch Government started the "Program Gasless Neighbourhoods" (PAW)[98]. This program was a knowledge and learning program and gave grants to 66 pilot projects throughout the Netherlands. All four government layers worked together. There was an extensive learning program and

[98] https://aardgasvrijewijken.nl/klp-paw/default.aspx

analysis of the development processes of the pilot projects, which included energy communities like WG Terrein in Amsterdam, Warm Heeg in Heeg.

By the end of the development of these pilot projects it became clear there was a gap between the needed investments and the revenue they could receive from the tariffs. The Dutch government developed a public funding mechanism to cover that gap called the District Heating Investment Subsidy (WIS). The WIS is an investment support for heat networks for small consumers (less than 100 kW) and central heating connections in existing buildings. It is for projects that focus on the construction of a new heat network in the residential environment.

Finally there are long existing energy investment (EIA) tax schemes. Companies can use the EIA when they invest in sustainable measures. With the Energy Investment Allowance (EIA) scheme. Companies can then deduct 45.5% of the investment costs from their profit. This lowers their taxable revenues.

### How to build your Business Case

Long-term commitment and planning security is key when deciding to implement Community Heating and Cooling projects, though less crucial for heat pump systems. To this end, involving the municipality in the energy community is always a good idea, as they can offer such long-term commitment contracts.

For the business case you will need to calculate the costs and the revenue. In the costs there are several post that will need to take into account. These will be different for any project, the costs are also not limited to these cost. Every project will have its own project specific cost.

#### 1. Costs

The costs can be divided into two sorts. The CAPAX, or the initial total investment for the installation (i.e. the pipes, central heat pump, metres), and the OPEX, the operational cost to keep the district heating network functional.

The costs of the CAPAX are often calculated by different parts of the total installation. There are the main pipes (from the source to the neighbourhood), the primary pipes (into different streets) and the secondary pipes (from the street to the houses). These are

different sort of pipes with different costs structure. Next to those cost you need to include the cost of the central heat source or industrial heat pumps. Finally the costs for the connection into the houses. If there are different types of houses you need to separate them, for example the cost to connect an apartment building with a central pump are different costs with individual houses and different from individual apartments on higher floors.

In other costs you should include the costs of the early stage development, the permits, and storage if needed.

In the OPEX you can use the same costs as the above mentioned posts. All need some kind of maintenance. These maintenance cost need to be taken into account. Next to that, if your energy community does the supply of H&C, the yearly cost of personnel, helpdesk and invoicing should be included in the OPEX costs.

## 2. Revenue

**Under revenue you can distinguish three different kinds. Subsidies, one-time costs, and tariffs.**

**Regarding subsidies, when setting up your business case you need to research what kind of subsidies can contribute to your project. These can be tax breaks for investment subsidies, which can be considered as an upfront revenue.**

**Another revenue are one-time costs. These are for example one time payments by customers for the installation. It is very important to determine what exactly is included in the tariffs for the installation and what are the one-time costs for the customer. For example, homes changing from fossil to renewable H&C will have to transfer to electric cooking. Are the cost for a new stove included?**

Tariffs are the monthly cost that people pay for the H&C. Within the tariffs you can make different variables. It can be based mostly on the consumption, which is a risk for your business case when people use less than the district heating costs, or you use set costs to cover the initial investment and a small part based on variable cost related to use.

## 3. Risk

In the business case you need to take some risks into account. You do this to give the risk a percentage that influences the revenue stream.

During the development of the project you have what is called the loading risk. Your revenue stream will only come in as fast as you can connect houses. If people don't accept the offer, or the placement of the metres and connections are more difficult than expected, your loading of customers goes slower than expected.

In the exploitation stage there is a risk of empty houses. You can calculate this by looking at the turnover of houses in the area and assume the time the house has no inhabitants in the meantime. When there are social housing corporations in the area they will have these numbers on record for their housing portfolio.

Finally there is the debtor risk. This is the percentage of customers that do not pay energy bills.

## 4. Heat loss

What also needs to be taken into account are the heat losses in a district heating network. These depend, among other things, on:

- The length of the pipes
- The flow and return temperature (low temperature concepts have correspondingly lower losses)
- The degree of isolation (insulation class) of the pipes.

## 5. Discount Rate.

When building the business case you need to determine the discount rate. This is the return on capital you want to achieve in the project. This is needed to cover the risk that is in the project. In a community energy project you aim to make no profit. This does not mean you should not use a discount rate. That would open your project beforehand to too much risk.

## 6. Templates

In the Netherlands the Dutch government contracted TNO (an independent not-for-profit research organisation) to create a template business case for district heating and cooling projects. The template[99] also gave civil servants and new initiatives insight in the business case of district heating. It can be used to start building your business case but should always developed by financial experts to make it project specific.

In the case of Energent's DHC network, they focus on new housing developments, since gas prices are still too cheap in Belgium, and hence citizens lack an incentive to invest in sustainable solutions. Under this model, 40% - 60% of the investment costs are paid directly when people buy their dwelling which is already equipped with a connection to Energent's network. The price depends on the size of the dwelling, as it is more expensive to connect a house to the network than an apartment block, given the homes' higher likelihood of heat losses. Their business model took approximately 3 years to develop, between the first negotiations with the housing developer to the first bill. Obtaining the permit took 2 years from the process, while the installation took 1.5 years. Accelerating permitting would also accelerate the rate of connections to community H&C networks.

The Luxembourgish energy community "Energy Revolt" replaces oil and gas boilers in individual dwellings for heat pumps, which are combined with solar PV for the electric

99 https://expertisecentrumwarmte.nl/PageByID.aspx?sectionID=202642&contentPageID=1672466

component. The energy community is owner, and installer of the heat pump, while it sells the heat to the owner of the dwelling. Its objectives are to offer a solution to exit fossil fuels when replacing the heating system, and to combine heating and solar energy into one package. The financing of these project is carried out by Energy revolt and its financial partners, while the project conception and management is done by "EnergiePark", a Luxembourgish company owned by 140 citizens with environmental aims. One of such projects is Luxembourg's "Solar Community Schwebach s.c.", which consists of 16 of such homes governed under a cooperative of home-owners. With the help of Energy Revolt, they both own and share the solar installations, heat pumps, and the central battery to ensure security of supply. This project is zero-carbon and has brought economic surplus to the local economy.

## Renewable H&C technologies

Consensus is forming that the main heating decarbonisation solutions for homes are:

- good thermal efficiency (which can be done through citizen-led renovations, which put the ownership of the energy renovation in the hands of people);
- combined either with a connection to a collective clean district heating system,
- or with individual heat pumps[100].

As we can see from the graph below, heat pumps (HPs) and solar thermal energy installations (TEIs) are estimated to be the cheapest technologies to run.

The added value of district heating and cooling systems is that all of the technologies described below can be connected to the network, offering a level of flexibility and security that cannot be achieved by any single renewable solution. Alas, their cost is also more elevated.

That being said, looking at the H&C transition from an exclusively financial lens would be a gross mistake, as we are all complex individuals that weigh different variables ranging from cost to environmental and social impact, or to the features of our buildings. The Commission's meta-analysis confirms this, as it found that "the individual decision-making process for a H&C technology is not driven solely by profit orientation, but rather by the pursuit of well-being"[101] This is perfectly aligned with the mission of energy communities, who must have a social and environmental logic, rather than the accumulation of wealth as a *raison d'***être**.

[100] Element Energy, *The Consumer Cost of Decarbonised Heat,* 2021 & ECF, EU-ASE, *Building Europe's Net-Zero Future,* 2022

[101] European Commission, *Overview of Heating and Cooling: Perceptions, markets and regulatory frameworks for decarbonisation,* 2022.

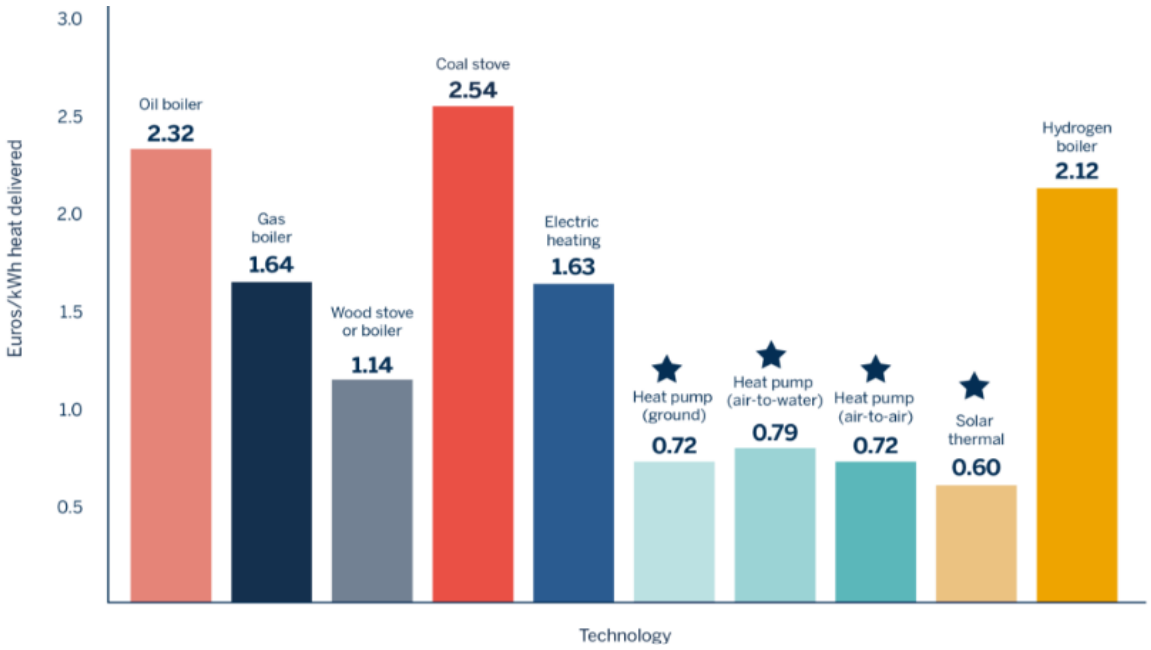



*Figure 5 - Title: Total cost of owning and running different heating technologies, 2030-2040.*

*© European Climate Foundation and the European Alliance to Save Energy, 2022*

## Heat Pumps

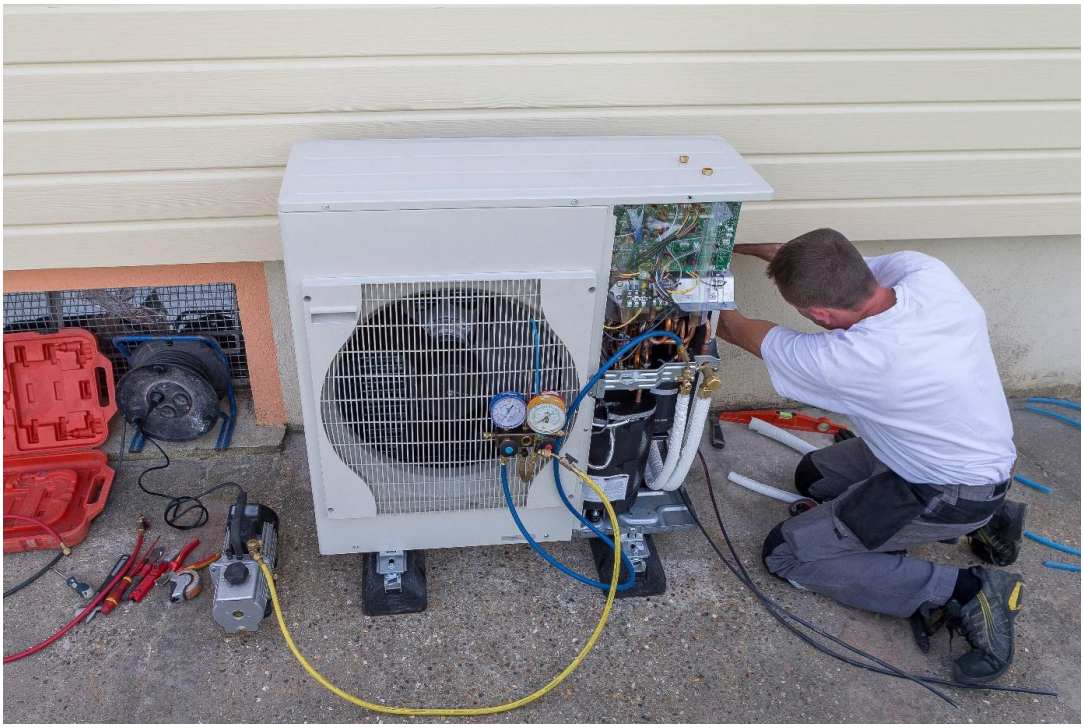


*Image 4 - heat pump installation © Adobe Stock, JPC-PROD*

District-level heat pumps use electricity to extract heat or cold from air, soil, water, steam, … and can do so very efficiently, Electricity, however, is now, at the end of 2023, not fully decarbonised, but will need to be by 2035 to achieve full decarbonisation by 2050[102]. To this end, we must recognise the value of the flexibility of these new electrified heat loads, as they will put pressure on existing power systems. Indeed, as the Regulatory Assistance Project (RAP) explains:

*"…This means enabling that electricity demand to be shifted to times of the day when renewable energy is abundant. Energy efficiency, heat storage, smart controls, and building-level renewable generation all contribute to the flexibility of electrified heating loads"*[103]

Not only do these solutions offer an affordable transition to RES H&C, but they also add resilience in case of external factors, such as an outage or extreme weather events.

[102] Rosslowe. C, *Zero-Carbon Power,* 2021

[103] RAP, *Taking the burn out of heating for low-income households,* 2022.

This is key, given that climate change is leading to extreme weather events, as shown by Carbon Brief's analysis[104]

### Thermal energy from surface water

With thermal energy from surface water you extract heat from surface water (e.g. lake, sea, canal, stream, river) with a heat exchanger. An electrically driven heat pump ensures that the temperature is sufficiently raised to provide heating and domestic hot water in winter. In many cases, the temperature of the surface water also allows you to cool the buildings in summer.

### Thermal energy from wastewater

We can use energy from wastewater (i.e. sewage) for heating and cooling. This is sustainable, ecological, and climate-friendly. A heat exchanger (placed in the sewer) captures the heat from the wastewater, which is then upgraded to heat for buildings through a heat pump. Sewage water has temperatures of 12°C to 18°C, making it a great source of energy.[105]

### Thermal energy from drinking water

We can also use heat and coolth from drinking water. From the drinking water pipe, H&C can be transferred via a double-walled heat exchanger for direct use or storage in the soil in a thermal energy storage (TES) system. The H&C is utilised, whereas the drinking water then flows back into the network.

ThermoBello (The Netherlands) developed a low-temperature district heating project in 2009, with temperatures between 30C - 50C. The drinking water protection zone did not allow them to use biomass, so it was decided to use the thermal energy from the drinking water basin that they cool down with a heat pump. This is a type of aquathermal energy. Furthermore, only a limited volume of drinking water is needed to generate heat, as a result, the water never cools down too much. The energy community owns the grid, produces the heat, and supplies it. This heating is supplied to 222 homes, 2 schools, and 2 office buildings, where it is used, and once cooled down is returned to the heating station.

[104] https://www.carbonbrief.org/mapped-how-climate-change-affects-extreme-weather-around-the -world/
[105] https://www.vmm.be/water/riolering/riothermie

Their (new) heat pump has a performance of COP 5 (1 kWh of electricity yields 5 kWh of heat).

> *I worked as a station manager of the drinking water station and was involved in the construction of the heating station. I now enjoy a pension, and I love living out my passion for technology in the heating station. I live next door and check in every day to see if everything is running smoothly.*
>
> Thermobello, Netherlands.

## Biomass

*Image 5 - ESEK "coffee-pellets" ©ESEK*

The energy communities that have opted for biomass energy usually opt for local wood chips, an energy source that requires little processing, and little transport, accompanied by a sustainable management of the resource, which makes it more environmentally attractive than wood pellets. Indeed, as Ecopower (a producer of pellets) observes "it is important to respect the balance between growth and consumption. If consumption is too high, accretion will be insufficient and we will end up with a barren landscape"[106]

[106] https://www.ecopower.be/groene-warmte/pelletdossier

In any case, all Community Heating and Cooling projects using biomass have short circuits for the supply to the biomass boiler, this is both an economic and environmental factor:

- Greater supply chains require larger quantities to be transported, and therefore larger sites to be installed - this can put a strain on more local, citizen-owned projects.
- Short supply chains also means less transport costs, which increases the price stability of the biomass. Nevertheless, shorter circuits require detailed logistics which must be adapted to each project/area, this can make the model more complex, albeit more economically and environmentally viable.

Despite the benefits of locally harvested biomass, there is an argument against it regarding local emissions from combusting biomass, This is even more salient for small boiler plants that are used intermittently (e.g. in summer for domestic hot water).

To overcome this, several energy communities have installed additional exhaust gas treatment systems, such as electrostatic precipitators (ESPs) which remove small particles from the mix. Given that an ESP applies energy only to the particulate matter, it is therefore much more efficient than wet scrubbers.

In any case, and whichever the solution chosen to overcome the particulate matter emissions, the medium to long-term objective remains to produce 100% renewable energy, with a bigger focus on thermal energy installations (TEIs)[107]

Ecopower[108] (Belgium), created in 1991 today has 70.000 members. Seeing the immediate need to replace fossil fuels - and given that almost 25% of its members did not immediately qualify for heat pumps or a connection to a H&C network - decided to construct their own pellet factory in 2014. This gave the citizens complete control over the choice of raw materials and packaging of the pellets, and allowed them to move away from fuel oil in their homes. The Limburg plant, located in the municipality of Ham, has an annual production of 20.000 tonnes of pellets, enough to satisfy the thermal needs of 5.000

[107] '*Retour d'experience de chaleur territoriale renouvelable et citoyenne',* LIFE Let'sGo4Climate Project, 2023
[108] https://www.ecopower.be/

average Flemish households. It had an investment of 11 million euros, and is 100% owned by the cooperators.

ERE43[109] (France) wanted to devise a modular boiler room adequate for small communities with high consumption in rural areas, such as schools, retirement homes, hotels, housing estates. Together with local companies, they designed the "Modul'R", a woodchip micro-boiler room with a power of 120kW and a capacity of 40m3, able to heat 10 to 15 homes. While the construction and installation of the boiler room is done by their subsidiary Meteor[110], the production, monitoring, supply, and maintenance of biomass is done by the energy community. ERE43 overcomes the issues associated with larger biomass sites mentioned above by operating on a <15Km circuit between the shaft and boiler room. Today ERE43 has installed over 27 micro-modules, delivering 4.420MWh of biomass in 2019.

> *'It's too bad to let the wood in our region rot, and to consume so much fuel oil. The idea is to associate foresters, farmers and local businesses to jointly design a heating solution adapted to local equipment, and which encourages energy savings. And it works !*
>
> ERE43, France

*Image 6 - ere43 modular boiler room © ere43*

[109] https://www.ere43.fr/
[110] https://www.ere43.fr/ere-43/notre-filiale-meteor/

ESEK[111] (Greece) is located in Karditsa, a region rich in residual biomass due to their predominant agriculture and mountainous forests. When the community rejected the installation of a wind turbine by a private company, the citizens decided to get together with farmers and the municipality to create energy out of the residue of their mismanaged forests and agricultural land. They get their primary biomass through agreements with farmers, municipal tree-pruning initiatives, and forest cooperatives for residual agricultural and forest biomass. This supply is achieved through various Memorandums of Understanding, and is employing farmers and tree-pruners to gather it, which fulfils ESEK's goal of avoiding rural exodus through the creation of renewable jobs.

It took them 2 years to have the first production of pellets ready for distribution.

Other systems also exist, such as Minoan's[112] (Greece), which aims to produce biogas from animal manure. This choice was made given the large amount of animal agriculture in Crete.

### Waste Heat

Recovery of waste heat has great potential in the pursuit of circular heating and cooling, this is acknowledged in the EU's 2016 "Strategy on Heating and Cooling".

There is of course the argument that burning waste cannot be sustainable, as it requires incineration. While this is valid criticism, our current reality is that we do lead lives that are waste-intensive (and will likely remain so in the next decade), and this waste requires treatment (i.e. waste plant). Re-using the heat that comes from the incineration of waste adds circularity to a process that would otherwise remain inefficient, furthermore, putting this thermal energy in the hands of citizens through an energy community ensures that the fate of the incinerator is democratically decided. In addition, under a district heating and cooling system, should the waste incinerator no longer be in use in 10 years, the energy community can replace the source of thermal energy (waste heat) for another one, such as PV coupled with industrial heat pumps, as a district H&C system allows for a large variety of thermal sources.

Beauvent uses CHP and is connected to a government-owned waste incinerator plant in Oostende (Belgium) from which they feed thermal energy to 1.000 apartments, 25

[111] https://www.esek.gr/en/archiki-english/
[112] https://minoanenergy.com/en/

companies, 2 hospitals, and the world's largest air conditioning manufacturer. This system reaches temperatures of 70 C - 90C and produces 13.000 MWh/year over an 8.6km system. Alas, their heating network for residential buildings reaches lower temperatures of 40C - 60C. The network is expected to have a lifespan of up to 50 years, with appropriate maintenance works.

They are developing more plans, such as using the excess heat from a crematorium to give thermal energy to a small heating network for a university. They are also studying the possibility of utilising heat from sewage water and sea water, through heat exchangers combined with heat pumps.

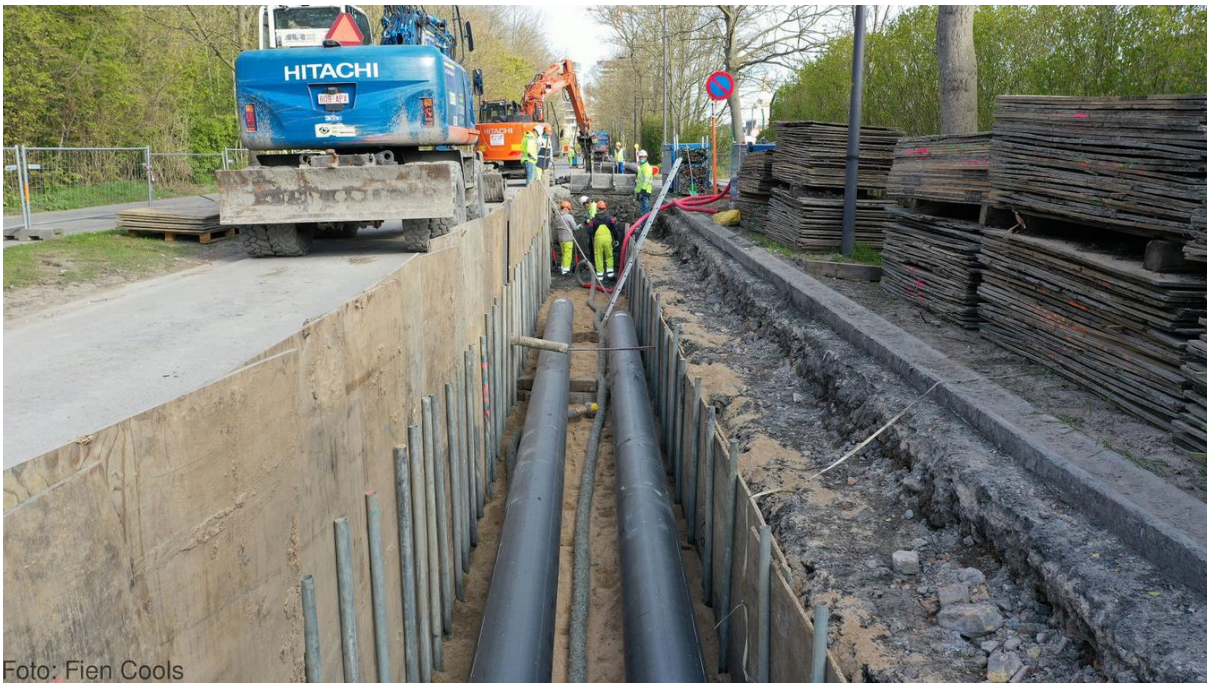



*Image 7 - Source: Beauvent, District heating network Oostende © Fien Cools*

Ecopower (Belgium) also carries out their heating and cooling activities by recovering the heat from the industrial process of a nearby company, Agfa Gevaert. The company used to make film roles for cameras, but now mainly produce X-ray films for hospitals. and the chemical process of making the film creates a lot of waste heat, Ecopower supplies this heat through their district heating network. . Out of this waste heat, 50% is consumed by the company Agfa Gevaert itself, whereas the other 50% is redirected to homes and local SMEs, aiming to cover 4 SMEs and 340 households by 2026. The pipeline required an investment of €5 million, and is today 1.3km long, with plans to keep expanding it to more homes and local businesses in the near future. It is a first generation system that reaches temperatures of 85C. As Ecopower's example shows, a high-temperature district heating

system can replace gas within 1 year in the current built environment. They expect the system to have an average lifespan of 50 years.

Energent (Belgium) also has a heating and cooling project based on industrial residual heat and residual heat from waste water. As co-investor and shareholder of the Ducoop[113] project, Energent will provide H&C services to the residents of Nieuwe Dokken from waste water, and a company that produces soaps and detergents. In addition, they will install a smart grid with PV production, as well as a central battery and smart control systems.

As they started their collaboration with the industrial site, 7% of the company in question was purchased by the cooperators of Energent. From this waste heat, they offer renewable H&C to 340 dwellings. The total cost of this project was €1.2 million, with €400.000 invested by the cooperative.

### Geothermal

Kliniek Sint-Jozef is a centre for psychiatry and psychotherapy in Pittem (Belgium). The site is in full development, with various new construction projects in combination with historic buildings. Kliniek Sint-Jozef issued a tender for the supply of sustainable heating and cooling for the site, for which Beauvent[114] was awarded as ESCO in January 2022.

The project consists of a sustainable boiler room in which the heat generators are installed. In addition, there is a borehole energy storage field (BEO) from which heat is extracted by the heat pump. This BEO field is also used for cooling during the summer periods.

The system provides low-temperature renewable heat supplied by an electric heat pump connected to 94 boreholes installed under the football field.

[113] https://ducoop.be/
[114] https://www.beauvent.be/project/warmte/sint-jozef-pittem

*Image 8 - District heating network construction © Beauvent, 2022*

In Sint Amandsberg (Ghent, Belgium) Energent is building a heating network running on shallow geothermal energy in combination with a water heat pump. To do this, the citizen energy community is carrying out 78 drillings to a depth of 150m for the construction of a Borehole Energy Storage field, where a number of vertical pipes are heated and cooled by the soil. This project will provide citizen-owned geothermal energy to 18 homes and 30 apartments in its first instance - it is expected to supply them with heat by October 2023. This project was financed in its entirety by the cooperative, giving Energent's members ownership over the project.

## TEIs & TES – Solar energy installations, solar thermal energy storage

*Image 9 - Solar thermal energy installation ©Adobe Stock, Springtime78*

According to the European Commission's meta-analysis on H&C, solar thermal installations were rated as the cheapest solutions and were perceived as the heating option with the lowest price risk.[115] This was true for the residential sector, as well as the industrial, and public sectors. Citizen-owned solar thermal installations are therefore a no-regret solution in the achievement of decarbonised H&C solutions.

Solar TEIs provide cities, towns, and communities of every size with clean heat, covering up to 100% of summer load, and include the possibility of combining them with other RES H&C sources.

You can therefore do a lot with solar heat, as it is also very useful in a heat network or for industrial processes, which often use a ground set-up. If the temperature of the system is too low, it can be combined with a heat pump. Some TEIs even convert the sun's rays into heat **and** electricity in so-called PVT panels.

[115] European Commission, *Overview of Heating and Cooling: Perceptions, markets and regulatory frameworks for decarbonisation,* 2022

**SWOT analysis of solar thermal integration in DH networks.**

| | POSITIVE | NEGATIVE |
|---|---|---|
| INTERNAL FACTORS | ***Strengths***<br>1. Very low operating costs<br>2. Emission free ($CO_2$, $NO_x$, noise)<br>3. Low investment risk | ***Weaknesses***<br>1. High specific CAPEX, reflecting in long payback times<br>2. Suitable areas for ST installations are limited in cities<br>3. Summer competition/ TES are needed to meet high ST share → increased investment and land usage |
| EXTERNAL FACTORS | ***Opportunities***<br>1. Increasing need for reducing $CO_2$ and increasing subsidies for renewables<br>2. biomass is more suited to high-temperature applications, mobility etc.<br>3. The investment costs can potentially decrease when the market increases | ***Threats***<br>1. The long payback times reduce flexibility and chance<br>2. Little public awareness of ST, lack of marketing, difficult to understand for decision makers<br>3. Electricity (power-to-heat) becomes cheaper and cheaper |

*Figure 6 - The Future of DH and the role of solar thermal energy, 2020. © SHC Task 55,*

The residential area of Duinwijck (Netherlands) in Vlieland is using solar thermal energy installations (i.e. solar thermal collectors) and thermal energy storage to rid the community of gas.

The local energy community captures the heat and immediately supplies it to the neighbourhood when there is demand, the excess heat is then stored in an underground basin with 2 million litres of water, heated to a maximum of 90C. In winter, this thermal energy is harvested again and distributed to the citizens via a heat network, in a perfectly circular and renewable process. Citizens, municipalities, and the Urgenda Foundation all participate in the project so that the inhabitants of this town can live gas-free. The storage itself can be heated in other ways, such as through wind turbines or residential heat.

## Recommendations

Community Heating and Cooling has multiple advantages, as the interest of participating in such a project oftentimes goes beyond providing capital. We observe positive externalities coming from citizen's involvement, such as higher participation in social and environmental projects at local level. Citizen participation in these projects also increase social acceptance about renewable energy sources.

Generally speaking, actively participating in the governance of a project improves the understanding of the issues linked to the deployment of heating and cooling technologies, which also increases trust in them. For instance, citizens participating in an energy community using biomass will be able to decide to overcome clear-cutting, monoculture forestry, or long supply chains that biomass industries often do not tackle. Furthermore, the democratisation of energy ultimately helps to accept nuisances related to the production of energy (e.g. construction and operation of facilities).

The fact that citizens have a say also helps ensure transparency in the energy community's activities, giving the members more informational control on their energy than with traditional market actors.

In the interest of expanding Community Heating and Cooling (CH&C) across the EU, we have created below a list of recommendations. We have created a list of recommendations *for energy communities*, in order to accelerate replication. We have also created a list of recommendations *for policy-makers*, in order to create an enabling framework for citizen-led heating and cooling.

### Recommendations from energy communities, for energy communities:

- Look for sources of thermal energy around you. Often, these can come from the most unexpected places, such as water surfaces. If you are in Belgium, here is a handy map of sources of thermal energy in water[116]
- If you want to start a H&C network, it must start with the source, so find a renewable source. Secondly, make sure that you find sufficient customers using heat (don't

[116] https://www.riothermie.be/

focus on the amount, but rather on their consumption), and the business case will present itself.

- Be careful not to overestimate the use of heat in new buildings, given that they are much more energy efficient, and hence consume less.
- If you are in Flanders, we recommend starting your citizen-project with a PV installation, it has a higher return on investment and is a great way to demonstrate the trustworthiness of your energy community. Once you have earned the trust of citizens and municipality, you should use the ROI from PV to build a community heating and cooling project. "The key to ensure further trust is to ensure thermal comfort".
- It's very important to include local governments in your energy community and its projects, especially given their crucial role in the heat monopoly.
- Many engineering firms have little experience designing heating grids, and overestimate the piping diameters and thermal power of the heat pump. We recommend getting a competent engineering firm to design the system, or hiring an expert to review the design.
- An investment horizon is the main challenge: Make sure you already have activities generating return, or try to cooperate with other organisations to tackle the challenge of high upfront costs.

**Recommendations for policy-makers:**

- Develop a supportive legal and enabling framework to incentivise and accelerate heating and cooling projects by energy communities.
- Finance specific civic engagement activities from the start of the project (i.e. feasibility study) in order to increase public participation. This could be a bonus/MWh scheme for citizen-led projects, or more imaginative activities such as fostering collaboration between citizens and local shops.
- A premium for heating and cooling projects led by citizens. This first batch of funding makes an enormous difference for the success of a project, especially considering the high cost of entering the heating and cooling market.

- Create guarantee funds for the organisations producing citizen-led thermal energy to avoid disruptions in the network if a producer is in breach of contract, or if it decides to no longer be a member of the network.
- Systematise market access to citizen-led heating and cooling projects through specific clauses. In Auvergne-Rhones-Alpes (France), 4 cooperatives have already signed similar contracts ('*contrats d'objectifs patrimoniaux*') engaging themselves to produce 'X' amount of installation over the next 3 years.
- Foster technological and R&D exchanges among energy communities to encourage the uptake of the most efficient systems.
- Change the national/regional voting requirements for general assemblies of building owners to simple majority. This will accelerate the roll-out of renewable community heating and cooling, as individual owners will not be able to block a project if it is supported by the majority.
- Drop gas as a reference price when studying new (or the expansion of) district heating networks across the EU. This is already the case in Denmark, where the government subsidises the gap between the cost of natural gas and renewable H&C.

# Annexes

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## Interview Questionnaire

GOVERNANCE:

1) Please explain your governance model
    a. How is it build, why?
    b. What percentage of your Energy Community is citizen-owned? What is the rest?
        i. **IF DONE WITH PRIVATE IND:** How do you make sure that the cooperative approach is kept?
        ii. **IF DONE WITH PRIVATE IND:** How do you ensure that the supply of H&C stays there? (e.g. company bankruptcy)
    c. How many hours do the volunteers/stakeholder put into it? How has your experience been with volunteers?
2) What pros and cons have you encountered on the governance structure? What would you recommend to other energy communities?
3) What drivers and barriers have you found in your governance model? What would you change?

EXPERIENCE:

1) Please explain your experience
    a. What is the members' opinion? What benefits have they encountered?
    b. What effects has Community H&C had on the local community?
2) What are the main driver and barriers to citizen participation?
    a. How did you deal with citizen uptake? (e.g. the deep nature of the works).
3) What are the main reasons the members have given to join?
4) What problems have you encountered in setting up Community H&C? What would you recommend, or do differently?
5) What differentiates your Member States to others when it comes to Community H&C?
6) What national legislation exists on H&C? How can it be improved for energy communities?
7) What vision do you have for Community H&C?

BUSINESS MODEL:

1) What business model did you choose? Why?
    a. What prices are you offering? How volatile are they? How does this compare to traditional fossil-based H&C?
    b. How did you raise the necessary financing?
    c. How was the public procurement process?
    d. Do you offer package deals?
2) What pros and cons have you encountered on the business model? What would you recommend to other energy communities as they do Community H&C business models?
3) What drivers and barriers have you found in your business model? What would you change?

TECHNICAL SPECIFICATIONS:

1) What technical specifications do you have in your system?
    a. What technologies do you use? Why?
    b. What is the size of your system?
    c. How is its performance? What energy efficiencies are you seeing?
    d. How do you take into account individual thermal needs?
    e. Can you retrofit existing infrastructure?
    f. What is the average lifespan of your system? How long did it take to complete?
    g. What is the cost of installation and maintenance?
2) What pros and cons have you encountered on your RES H&C system? What systems would you recommend to other energy communities?
3) What drivers and barriers did you encounter in your system? What would you change?

OTHER:

1) Do you consider publicly-owned H&C as Community H&C?
2) What plans do you have for the future of your Community H&C system?
3) How would you increase public knowledge about Community H&C?
4) What would you say to someone thinking of starting their own Community H&C?