nationalgrid

An introduction to community heat

A guide for community energy organisations interested in developing their own community heat projects.

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About National Grid

National Grid is the largest electricity transmission and distribution business n the UK, delivering electricity safely, reliably, and efficiently to the customers and communities they serve, while working towards a cleaner, greener energy future.

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regen
transforming energy

Regen

Regen is an independent centre of energy expertise with a mission to accelerate the transition to a zero-carbon energy system. We have nearly 20 years' experience in transforming the energy system for net zero and delivering expert advice and market insight on the systemic challenges of decarbonising power, heat, and transport.

Regen is also a membership organisation, managing the Regen members' network and the Electricity Storage Network (ESN) – the voice of the UK storage industry. We have over 150 members who share our mission, including clean energy developers, businesses, local authorities, community energy groups, academic institutions, and research organisations across the energy sector.

Purpose of this guide

Low carbon heating is a vital part of our journey towards a net zero future and forms the biggest remaining challenge in decarbonising our energy system. Heating makes up about **37% of total UK emissions**.

It remains such a difficult task to decarbonise heat because of the scale of fossil fuel heating still in use across the country and the quantity of gas network infrastructure still in place.

The UK also has some of the most poorly insulated housing stock in Europe.

Low carbon heating technologies, like heat pumps, biomass heating and solar thermal, are key to decarbonising our domestic, commercial and industrial heating.

The sector is in desperate need of innovation and new approaches to a problem that is fundamentally rooted in governmental policies and individual decision making.

Community-led heat projects can play a key role in keeping local benefit at the heart of the heating transition, as well as easing some of the growing pains associated with low carbon heating uptake.

They can also make these options more financially viable for homeowners and provide communities with the support to not only decarbonise their heating, but also to own and benefit from the solutions.

One of the biggest advantages a community energy organisation has over a third party or private group coming in to provide a solution from outside is that they are inherently embedded in the local area. Community organisations hold a power to connect with the people at the heart of these projects.

Purpose of this guide:

This introductory guide aims to provide a starting point and inspiration for developing your own community heat project. It is designed to provide an accessible overview on the subject, offering an insight into different types of heat projects, ideas for how to get started and case studies of pioneering projects. Our aim is to demystify the process and point you in the right direction for developing your own project. This guide focuses on developing heat generation projects and as such it touches upon but does not cover fabric or energy efficiency retrofit in detail.

Who this guide is for:

This introductory guide is aimed at any community with an interest in developing their own low carbon heat project. It's important to note that this guide is just the beginning of your journey towards a community heat project. The path to a successful project will require additional in-depth, location-specific research, and a clear understanding of the unique challenges and opportunities of your local area.

An introduction to community heat

Reducing emissions from our homes and buildings is a critical step towards combating climate change. As we strive to create a more sustainable future, it is becoming more and more important to help people move from fossil-fuel heating such as oil and gas boilers onto low-carbon forms of heating like heat pumps or low carbon heat networks.

When we think of "low carbon heating", we usually think of people installing heat pumps in their homes. However, community energy organisations are increasingly leading and taking ownership of their own low carbon heat projects, helping local residents and businesses to decarbonise.

After all, who better understands the needs and aspirations of a community than the people who call it home? By harnessing the collective power of communities, these projects can provide solutions that align closely with local values and priorities.

The purpose of this guide is to provide community energy organisations with the insights and practical information needed to deliver their own community-owned heat initiatives.

Whether you are starting from scratch or looking to expand your community energy work, this guide will provide knowledge and guidance to help navigate the landscape of community-owned heating.

While fabric retrofit may form part of this journey, the main purpose of this guide is to focus on heat generation projects. Throughout this guide, we will explore the different types of heating projects that can be delivered by community-led groups, offering examples and best practices along the way.

We will delve into the crucial steps involved in project development, including getting the community on board, selecting appropriate technologies, forming partnerships, and securing financing.

1. Community heat basics

1.1. Types of low carbon heating

There are several different types of low carbon heat technologies that can be used for your community heat project.

The most common types include ground source heat pumps, air source heat pumps, water source heat pumps and locally sourced biomass. Solar thermal is another option. We have included a brief explanation of how these technologies work below.

Heat pumps (air, ground and water source)

Heat pumps work like a refrigerator in reverse, extracting heat from its surrounding environment and transferring it inside. A heat pump works by:

1. Taking **heat** from an outside source, such as the ground, water or the air, and **passing it over the heat exchanger** on the outside of the heat pump. The heat causes the refrigerant liquid inside the heat pump to **evaporate into a gas**.
2. **Electricity** is then used to **compress** the refrigerant, increasing its pressure and its **temperature**.
3. The hot gas is then **passed over the internal heat exchanger** and then transferred to a central heating system, hot water system or air within the house.
4. The refrigerant cools, expands, **returns to liquid form** and the system starts again.

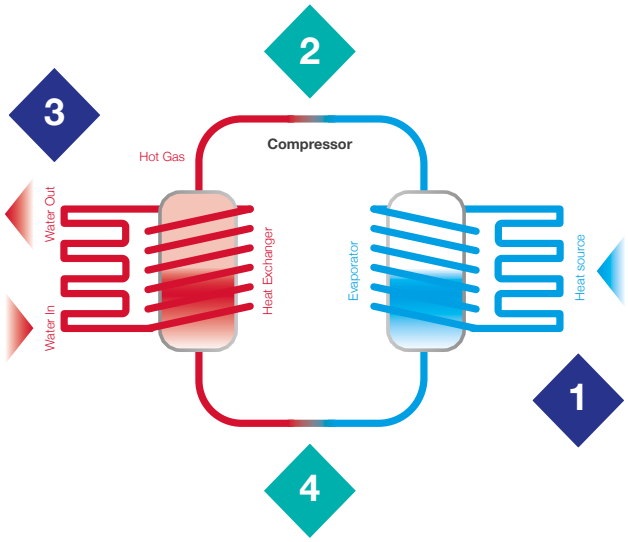


Figure 1 Diagram of how a heat pump operates

The efficiency of a heat pump is measured by the Coefficient of Performance (COP), which shows how many units of heat are produced for each unit of electricity used. A COP of 2 to 4, or potentially even higher, can typically be achieved for some types of heat pump.

Being powered by electricity also means that heat pumps can benefit from the increasingly low carbon electricity supply in the UK (solar, wind etc.) meaning they can greatly reduce the carbon emissions from heating in a household.

It is best for a heat pump to serve a well-insulated building that stays and gets warm easily.

Well-insulated homes keep the heat in and reduce the workload for the heat pump and allow it to operate more efficiently. Other factors can also affect this efficiency, such as heat pump sizing, maintenance and the outside climate, but generally speaking heat pumps tend to be more efficient than a gas boiler.

There are three different forms of heat pump: **air source**, **ground source** and **water source**.

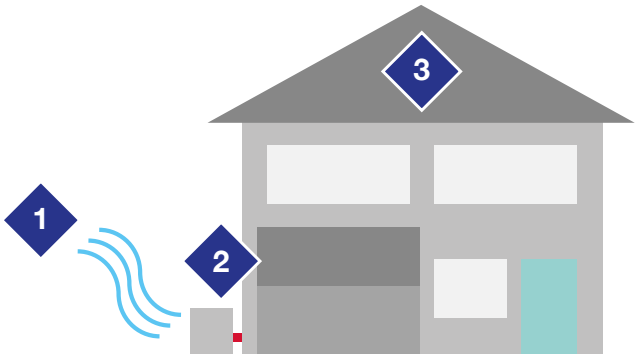
Air source heat pumps

An air source heat pump uses the air outside to regulate the temperature inside a building.

It takes heat from the air and transfers it to the heating system of the house, and potentially vice versa when the house needs cooling.

They can extract heat from temperatures as low as -15°C.

Air source heat pumps tend to be either air-to-air, where heat from the air outside is used to heat the air inside the house, or air-to-water, where the heat from the air outside is used to heat the wet central heating system. The example in figure 2 shows an air-to-water heat pump.



1 Heat pump extracts heat from air outside

2 The heat pump compresses the air, raising the temperature of the fluid inside the heat pump

3 The fluid is then sent around the house to radiators or through underfloor heating

Figure 2 A diagram of how an air source heat pump works

Pros

- Cheaper upfront installation costs than other types of heat pump
- Easier to maintain than other types of heat pump

Cons

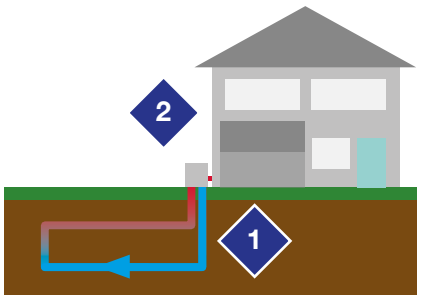
- Less efficient than a water or ground source heat pump
- Subject to noise and space restrictions

Ground source heat pumps

A ground source heat pump uses the earth's relatively stable temperature to heat and cool buildings. Piping is buried in your garden or in a borehole and helps transfer heat from the ground to the building. It can potentially carry heat back out in the summer.

To absorb enough heat from the ground, either deep pipes are drilled or they are laid over a large area in shallow ground. Both types are subject to ground conditions.

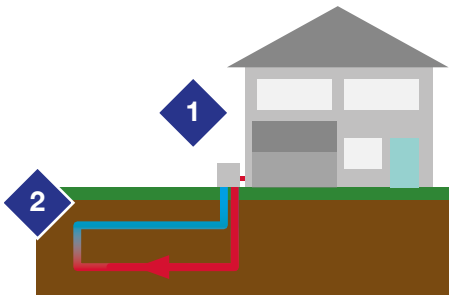
Ground source heat pump (winter)



1 Fluid flows into tubes and collects heat from the ground

2 Heat from the fluid is transferred to the heat pump. Heat energy can be used around the house

Ground source heat pump (summer)



1 Heat pump extracts hot air from the house and transfers it to the fluid in the pipes

2 The stable temperature of the Earth cools the fluid in the pipes. Cool water is returned to the house

Figure 3 A diagram of how a ground source heat pump works in winter and summer

Pros

- Greater year round energy efficiency due to more stable ground temperatures
- Quieter than an air source heat pump

Cons

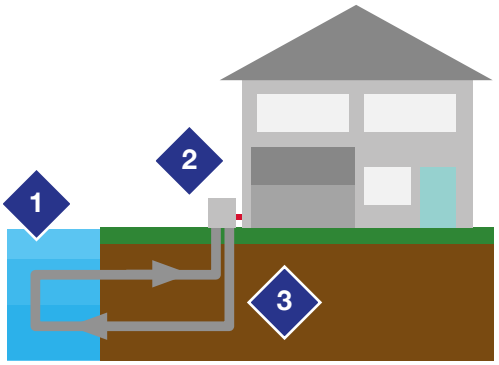
- Higher installation costs due to significant ground works required
- Subject to ground conditions and suitable space

Water source heat pumps

Water source heat pumps use the same technology as ground source heat pumps, taking heat from water sources instead of the ground. They are commonly used in places with access to water bodies like lakes and rivers.

For example, both the Thames and the Clyde have been used to provide heat to local industrial and commercial buildings.

Water source heat pumps have also been used to capture and use the heat energy from sewage water.



1. Water is pumped from the water source
2. Heat of the water is transferred to the heat pump. Heat energy then can be used around the house
3. Water is returned to the water source

Figure 4 A diagram of how a water source heat pump works

Pros +

- Higher efficiency than an air source heat pump
- Less groundwork needed than a typical ground source heat pump

Cons -

- Requires a suitable body of water
- High upfront installation costs
- Permitting requirements

Biomass and biogas heating

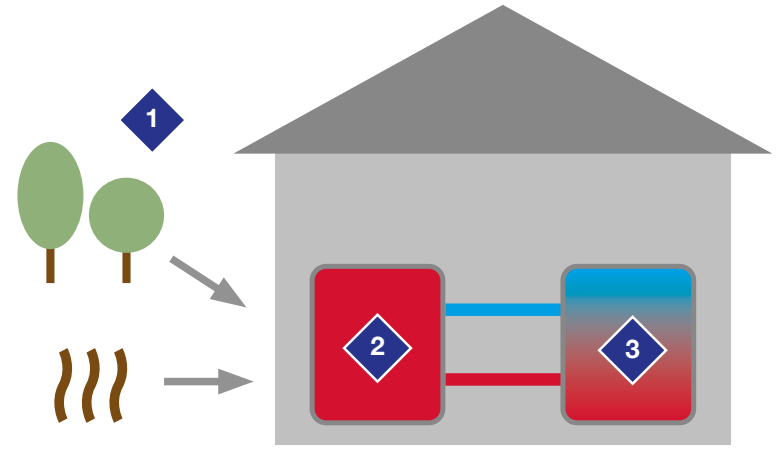
Sustainable biomass refers to organic materials derived from plants, animals, or other biological sources that are used for energy production in a manner that maintains ecological balance and does not deplete resources faster than they can be naturally replenished.

Biomass projects often use sustainably sourced local wood chips/pellets.

However, truly sustainable biomass can be difficult to achieve, as it can take many decades for the carbon from wood chips/pellets to be reabsorbed by new growth.

Biogas can also be used for heating.

Biogas is produced when organic matter, such as food or animal waste, is broken down by microorganisms in the absence of oxygen.



1. Biomass is stored and fed into the biomass boiler
2. Biomass is burnt in the biomass boiler and heats up water in the thermal storage tank
3. Hot water tank distributes hot water around the property

Figure 5 A diagram of how a biomass heating system works

Community-level biomass or biogas heating can use a centralised biomass heating system, similar to a boiler, that is either used to provide heat and hot water to multiple buildings or properties within a local community or to multiple residences within a shared building. It is also possible for biomass and biogas boilers to heat individual homes, as shown in figure 5.

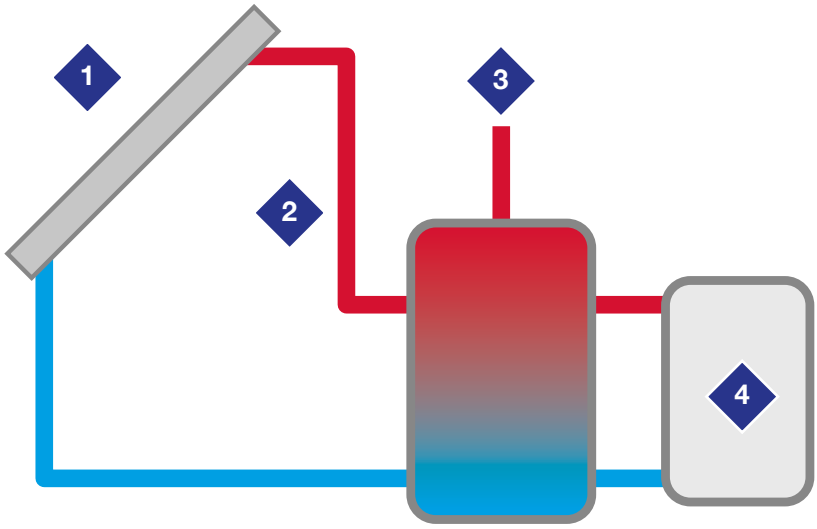
Solar thermal

Solar thermal systems capture the sun's energy to heat a fluid (usually water or a heat transfer fluid) and then use this heated fluid to provide space heating and/or domestic hot water heating.

Solar collectors can be installed on rooftops or open land. The number of collectors required will depend on the size of the project. Hot water can be stored in well-insulated tanks.

In the right circumstances, solar thermal can also be combined with solar PV to provide electricity alongside heat.

The seasonal variability of solar production means that there may be a requirement for a backup heating source for the hot water tank.



1. The collector captures radiation from the sun, heating up antifreeze fluid in the pipes
2. The antifreeze is pumped to the hot water tank, where it transfers the heat
3. Hot water is taken from the tank and distributed around the house
4. A back up boiler is kept connected to the system for the colder months

Figure 6 A diagram of how a solar thermal system works

Hydrogen-ready boilers

Hydrogen often forms part of discussions around heating. Proponents of hydrogen heating say that it could be used in a similar way to gas by hydrogen compatible boilers with minimal disruption to homeowners. However, in 2023 the National Infrastructure Commission recommended that government should not support the rollout of hydrogen heating.

The energy need in the production process for hydrogen means it's significantly more energy intensive to produce compared to other forms of low carbon heating.

Multiple studies, including from the International Energy Agency, have predicted minimal demand for hydrogen usage in home heating. The Welsh Heat Strategy summarises this well: "Efficiency losses of around two-thirds are inherent in the conversion from electricity to hydrogen. As such it will remain a more expensive fuel than electricity and will not be competitive in some sectors. This is one of the reasons, as detailed in the CCC's Balanced Pathway, hydrogen is unlikely to have a significant role in supplying heat to buildings."

Other issues include, for example, whether the gas network could cope with the smaller hydrogen molecules without significant leakages, which is a potential concern as hydrogen is highly flammable. Hydrogen will be a key fuel in the energy transition but is likely to be focused on higher value usages such as decarbonising heavy industry and some forms of transport.

1.2. Types of community heat project

When it comes to community heat projects, there is no one-size-fits-all solution. The type of project chosen will depend on a number of factors, including the location, type of buildings, community preferences and scale of the project (as set out in **Chapter 2** of this guide). Table 1 sets out some of the different types of community heat project that you may want to consider.

Projects may involve a combination of heat, renewable energy generation and improvements to the fabric efficiency of buildings (but may not have all these aspects).

A community heat project may decide to focus on decarbonisation of community buildings rather than, or as well as, homes. This could involve installing heat pumps or alternative heating technologies and may also involve fabric efficiency measures.

A community building-focused heat project can be a great first step and can lead to other projects in the local area.

Table 1 Types of community heat project

Type of project	Overview	Examples
Low carbon heat network/district heating system	Heat networks supply heating and hot water to multiple buildings or homes from a centralised heat source. Instead of each building having its own individual boiler or heat pump, heat networks supply heat through a network of insulated pipes from an energy centre. Heat networks are a flexible solution that can cover a relatively large area, or a smaller area such as supplying a cluster of buildings. Sharing a source of local heat is often cheaper and more efficient compared to using individual boilers. Low carbon networks can use a biomass boiler or heat pumps to provide heat to buildings.	**Bristol Heat Network** **Springbok Sustainable Wood Heat Co-operative**
Street/ neighbourhood heating	Similar to a heat network, a shared ground source heat pump uses a ground loop of pipework that passively absorbs the surrounding heat. This heat is then shared with several houses. This can enable a range of homes to connect and enables the cost of the groundwork to be spread, reducing the cost for each home.	**Chipping Community Energy** **Kensa Heat the Streets** **Net Zero Terrace (Rossendale)**
Communal heating (in a single building)	A block of flats can have a shared heat pump to provide heating and hot water for all the individual properties within the building. A network of insulated pipes will then run from the ground source or air source heat pump to each individual flat. The shared heat pump system is controlled centrally to ensure optimal performance and fabric efficiency. Each flat will still have its own thermostat to regulate the temperature according to the residents' preferences.	**Kensa Contracting and Thurrock Council replacement of night storage heaters in three social housing high-rise tower blocks with ground source heat pumps.**
Collective purchase of heat pumps	Community groups can collectively purchase heat pumps to take advantage of bulk buying and cost-sharing benefits. The community group may also explore funding options, which may include government grants, local incentives, or renewable energy financing schemes to support the purchase of the heat pumps. They may also consider a community maintenance plan.	While we have not yet seen this happening in the UK, there are international examples including schemes run by: **Efficiency Maine** **CLEAR-X** **European Commission**
Fabric retrofit measures	Fabric retrofit measures might include installing better insulation and sealing gaps to prevent drafts; i.e improving the 'fabric' of the building. A community organisation may choose to do this amongst local residents. These measures may be taken alone or alongside a new heating system.	Lots of community energy organisations are already doing fabric retrofit measures, we suggest looking at the Centre for Sustainable Energy's **Community Retrofit Guide**

CASE STUDY

Springbok Sustainable Wood Heat Co-operative

Type of project: Biomass district heating

Stage of project: Operational since 2015

Project website: springbokwoodheat.co.uk

Funding received: Renewable Heat Incentive, community share

The Springbok Sustainable Wood Heat Co-operative has been operating a locally sourced woodchip-fuelled district heating system serving a hamlet and residential home since 2015.

The project replaced a large number of oil boilers in an off-gas grid community.

The project comprises two boilers that burn woodchip in a centrally located purpose-built boiler house. One boiler supplies heat and hot water via a heat main to Care Ashore, which is a charity providing accommodation for retired seafarers in a large Victorian house..

The second boiler provides heat and hot water via two heat mains to a nearby residential block and to a complex of small houses, maisonettes and bungalows.

The co-operative maintains and operates the system. It was funded through two community share offers, with a total of £425,000 raised. The heat customers pay the co-op for heat and the Renewable Heat Incentive is also being claimed.

The adjacent woodland has provided the wood chip for the Springbok boilers since 2020 and is managed to maximise the potential for butterflies.

The project is focussed on several different biodiversity enhancements, of which you can find more detail about at **rosemarylanewoods.uk**

Some of the challenges that this project needed to overcome included:

- Developing a system of invoicing.
- Ensuring the quality control of wood chip.

1.3. Insulating buildings

It is important to consider whether improvements to existing buildings are needed. Energy efficient properties are key to ensuring that the low carbon solutions implemented are cost-effective for the customers.

Fabric retrofitting involves upgrading existing buildings with energy-saving measures to reduce or prevent potential heat loss. A heat loss survey (mentioned in **2.2.2**) is likely to provide recommendations regarding whether retrofitting properties is needed.

As with a heat project, there is no one-size-fits-all approach to fabric retrofit as it will depend on the type of buildings and the heat loss experienced. Fabric retrofit may involve some of the approaches set out in the table below.

This is by no means an exhaustive list; we recommend taking a look at Centre for Sustainable Energy (CSE)'s **community retrofit guide** which goes into detail around the aspects that need to be considered if your group is considering offering a retrofit service.

It is also worth taking a look at the **PAS 2035** energy retrofit framework, which provides best practice for the implementation of these measures.

Table 2 Typical fabric retrofit improvements

Retrofit action	Summary
Insulation upgrades	Adding or enhancing insulation in walls, roofs, and/or floors to minimise heat loss.
Window or door upgrades	Replacing old windows and/or doors with energy-efficient alternatives to reduce drafts and keep the home warmer.
Air sealing	Sealing any gaps, cracks, and openings in the walls of the building to prevent heat leakage.
Radiator upgrades	Replacing older radiators with larger, more efficient radiators that distribute heat more effectively and evenly throughout the building.

CASE STUDY

Retrofit Balsall Heath

Stage of project: Operational

Project website: facebook.com/RetrofitBalsallHeath

Retrofit Balsall Heath is a community-led neighbourhood project that is currently retrofitting 700 homes through Birmingham City Council's "Warmer Homes Funding". They are using partial retrofit measures averaging at £10k per home, including insulation, solar PV, windows/doors, and heat pumps.

The uptake of retrofit in the local community has been encouraged by reaching out through existing community groups on social media, door knocking, local media, local events and using local street 'champion' outreach.

1.4. Generating renewable electricity alongside heat

You may want to consider generating electricity alongside your heat project.

For example, heat pumps need electricity to run, and installing renewable energy generation can provide that electricity. The most common form of doing this is through solar panels, but communities have also started to look at the potential for using a wind turbine to power a heat network (such as in the Bishop's Castle example below).

This is something that would usually be considered at the feasibility study stage (see **section 3** of this guide). It is important to consider that while adding renewable energy generation can provide a direct benefit for your heat project, it can also add an additional layer of complexity to the design and consenting of your project.

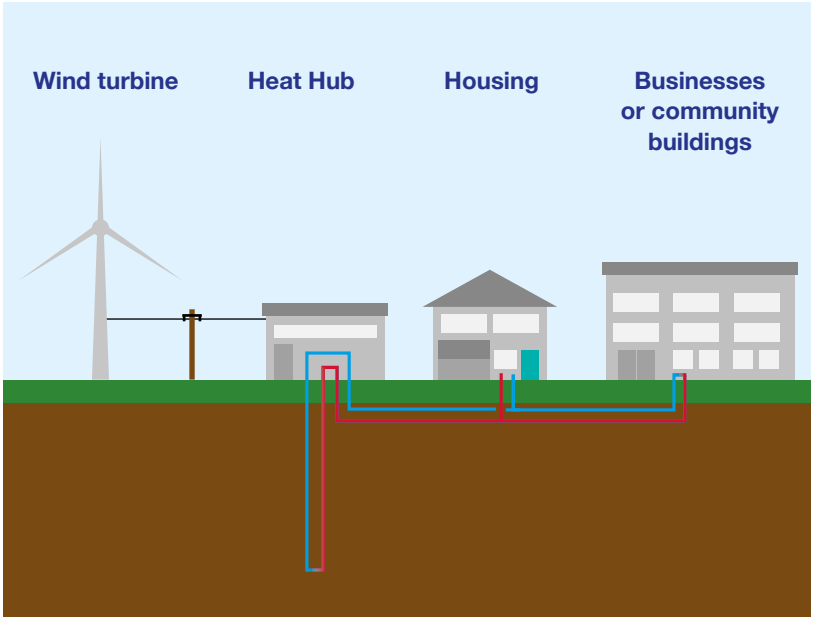


Figure 7 Diagram of potential ways to link heating and renewable energy (modified from Bishop's Castle heat and wind project)

CASE STUDY

Bishop's Castle heat and wind project

Type of project: Wind and air source heat **Stage of project:** Pre-planning

Project website: lightfootenterprises.org/climate-action

Funding sources: Part-funded by a grant received from Power to Change obtained through Shropshire and Telford Community Energy (STCE).

Bishop's Castle in south Shropshire is not on the gas grid, so most of the heating comes from oil and LPG boilers. The project aims to develop a heat network to supply heat from an air source heat pump that would be powered by a community owned 1 MW wind turbine. A 500 kW solar farm may also be developed to help power the project.

The heat network would supply at least 100 houses as well as the community college, leisure centre and Enterprise House. The centralised heat pump would supply hot water through pipes into houses.

Each house would have a heat exchanger rather than an individual heat pump.

It was found that the proposed heat network would not be viable without the wind turbine. Any surplus profit made by the wind turbine can go back into funding community projects.

At the time of writing, the onshore wind turbine has been allocated in a local authority Place Plan, with a future planning application to be submitted.

Ecology and further feasibility studies will be starting soon.

2. Getting started

Each community is unique and there is no easy one-size-fits-all solution for community heat. The best place to start is through spending time talking to your community to understand their preferences and to get them on board with the idea; this process is often called 'community engagement'. At this early stage, it is useful to get an understanding of the different types of buildings in the area, the existing heating systems that people use and what they may want from a community heat project.

2.1. Speaking to your neighbours

You can't have a community heat project without your community.

All our homes have a heating system of some kind and everyone will be at a different point on their journey to net zero. For some, particularly for those who have recently replaced their fossil fuel boilers or are in rented properties, there might seem to be few or no actions they can take.

The very first step in any community project is to build awareness and trust. This takes time but is critical in ensuring support for whatever your project proposes and for overcoming the inevitable obstacles that will crop up.

It is tempting to undertake all the research into technologies, grant funding and business models at the outset and simply present the 'solution' to your community, but this rarely works as:

1. **There will unlikely be a single solution that works for everyone equally (particularly when considering heating systems).**

2. **Community members need to be part of the decision-making processes throughout the project to ensure that the project reflects local preferences.**

We recommend starting the conversation with the community early, to let people know that you are thinking of developing a community heat project, to explain the benefits and to gauge levels of interest.

Through talking to your neighbours, it is important to understand their needs and preferences. In later stages of community engagement, you may find it useful to undertake more focused engagement.

It would be useful to consider what you would like to get out of it, what information you are able to share at each stage of the process and what information you are looking for from community members.

At a later stage in the process, this may involve using a questionnaire to get information on people's preferences and about their existing heating systems.

How to involve the community

You may want to consider different methods of getting the wider community involved in the project. This could include a mixture of the following:

Public Meetings and Workshops

Hosting public meetings and workshops is an excellent way to introduce the community to the project. These events provide an opportunity for project leaders to explain the benefits, goals, and processes of the community heat project. It also offers community members a chance to voice their concerns, ask questions, and provide valuable input.

Information Sessions and Webinars

Information sessions and webinars are particularly useful for reaching a larger audience, especially those who might not be able to attend physical meetings. They also allow for real-time Q&A, ensuring that community members are well informed.

Surveys and Feedback Forms

Conducting surveys and distributing feedback forms allows community members to express their opinions and preferences. These tools can help project leaders understand the community's priorities, concerns, and ideas.

Community Liaison Groups

Establishing community liaison groups can create a direct line of communication between project leaders and community members. These groups represent different segments of the community and serve as a sounding board for ideas and concerns. Regular meetings can ensure ongoing collaboration and transparency.

Online Platforms

You could use existing social media groups, dedicated project websites, and online forums to share project updates, relevant articles, and engage in discussions. Online platforms provide a space for community members to ask questions, share experiences, and exchange ideas in a convenient manner.

Site Visits and Demonstrations

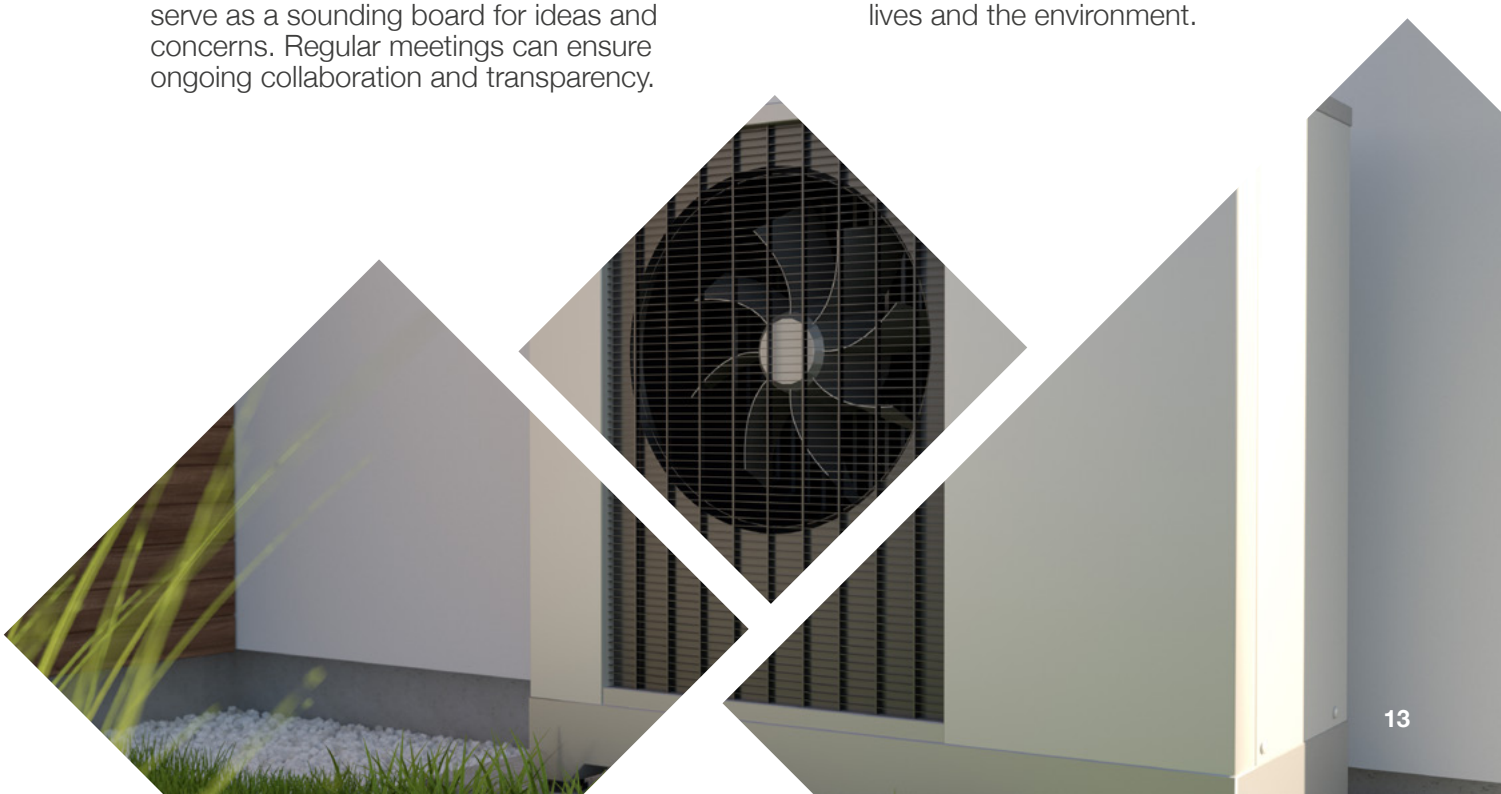
Site visits and demonstrations can give community members a direct experience of the project's physical components. Whether it's a visit to the project site or a demonstration of the technology involved, these activities can enhance understanding and enthusiasm among community members.

Partnerships with local organisations

Consider collaborating with local community organisations, schools, and businesses to reach a wider audience. These partnerships can help spread the word, increase participation, and tap into existing local networks.

Storytelling and Visual Materials

Use compelling stories, videos, and visuals to illustrate the project's benefits. People often connect with personal stories and visuals that showcase the positive changes the project can bring to their lives and the environment.



Reaching the harder-to-reach groups

Engaging all members of the community, including those who are often harder to reach, is essential for a well-rounded and inclusive community heat project. To ensure that the engagement process reaches the wider community, consider implementing the strategies set out in figure 8 below.

Figure 8 Suggestions for engaging the harder to reach community members

Keeping the community involved as the project progresses

It is important to keep communities involved and up to date as a project progresses. Ensure that community members are being actively involved throughout the project through providing clear information about the different stages of the project and providing an opportunity for them to feedback and help shape decisions at each stage.

One way to do this is to have a point of contact that the community members can speak to about any concerns, ideas, and feedback. This can help community members to have a deeper understanding of the project, build their trust in the project and ensure any questions are answered. Another method is to provide regular updates in a newsletter. A newsletter could be used to highlight project milestones, showcase community involvement, and keep everyone informed about the project's progress.

CASE STUDY

Calder Vale and Bonds Low Carbon Energy Scheme

Type of project: Ground source heat, small shared loop

Stage of project: Early design stage

Project website: equalityheat.co.uk/project/calder-vale-and-bonds-low-carbon-energy-scheme

Funding received: Electricity North West (ENWL), Powering our communities fund

Calder Vale Village is an off-gas village with a ward population of about 2,000 people. The community are exploring the feasibility of shared ground source heat pumps. The potential approach would involve installing community-owned boreholes for dwellings wishing to install a ground source heat pump. This approach offers homeowners the benefit of improved heat pump efficiency, particularly through the very coldest weather, without having to fund the borehole costs, which instead will be funded through an annual standing charge.

Prospus Group and eQuality Heat are working with the Calder Vale and Bonds Low Carbon Energy Scheme working group to establish the level of interest amongst residents and businesses and develop the business case for the scheme.

2.2. Understanding different types of houses, buildings and heat demand

Understanding the different housing types and buildings within a community is crucial for determining the most suitable form of community heat project. Different housing structures, such as single-family homes, multi-unit buildings, or mixed-use developments, have varying energy needs.

Locational factors are also important. Understanding the housing types within the area and the potential role that community buildings might play in that are crucial to understanding the form that your project might take.

2.2.1. Collecting data

One of the biggest advantages a community energy organisation has over a third party or private group coming in to provide a solution from outside is that they are inherently embedded in the local area. As touched upon above, community organisations hold a power to connect with the people at the heart of these projects.

This connection to the local area and people means there is an opportunity for communities to take ownership of this local data and benefit from it. Data to understand what kind of solution might be appropriate, but also important with regards to potential future innovations around flexibility, knowing and signalling when to increase or decrease heat usage to support when there are high loads on the grid locally.

2.2.2. Housing stock

When considering a community heat project, it is important to understand how many houses or buildings there are in your community, what types of building there are, how close they are together, and how many might be suitable for your project.

An initial assessment of the housing in your local area can help you to make decisions on the scale and design of your heat project, and there are several key factors that can come out of this initial assessment that will guide the type of project you decide to do:

The types of building in the area

The type of building can influence its heating needs and the appropriate solution. Detached, rural properties naturally have more space for technology like air source heat pumps, whereas terraced houses may have to look for more communal, space-efficient solutions.

Age of buildings and levels of insulation

The housing stock in the UK is amongst the oldest in Europe, with older houses typically being more poorly insulated and less energy efficient. Knowing the age of the buildings in your local area and the existing levels of insulation can give an indication of what kind of fabric retrofit work might be needed. See the **insulating buildings section** of this guide for more information. A more accurate method of estimating heating loss from buildings is to hire a specialist surveyor to undertake heat loss surveys.

Housing density

Knowing the number of houses or residents per unit area will give you an idea of the level of demand for heat, as well as how much space there will be for the technological solutions you might put in. The denser housing is, the more communal solutions such as district heating tend to be appropriate.

On- or off-gas grid

Whether a community is on or off the gas grid can have an influence on the type of solution appropriate for them and the speed with which they might need to transition the heating technology in their area.

Existing heating system

The existing heating system of residents in the community will be likely to impact their willingness to transition to a new low carbon solution. The residents' comfort with their old system, the age of the system and the current costs may vary significantly from house to house, and this should be treated with sensitivity in all cases.

Heating demand

The different heating demands of the residents of your area will have an impact on what kind of project you might choose to do. This can be impacted by the size and level of insulation of existing properties (see section **2.2.3** below). Additionally, having big energy consumers like businesses with industrial processes can create a strong customer base for the deployment of a district heat network.

Tenure: rented/owner-occupied

The majority of heat pumps installed at the moment have been in owner occupied buildings, with a smaller percentage owned by housing associations and local authorities, and a very small number in the private rented sector.[1] If there isn't a strong financial proposition to landlords in the local area, the challenge of getting heat pumps into rented properties may need to come through policy enforcement, making it a challenging area for communities to tackle.

All of this information could be gathered through undertaking a survey of the community that asks about housing and heating types. This survey could also be used to gather interest in a project. This could be done as part of a feasibility study (see **section 3** of this guide).

Some community organisations have partnered with university students undertaking dissertation research to undertake such surveys.

1 English Housing Survey 2021 to 2022: energy, Department for Levelling Up, Housing & Communities, **gov.uk/government/statistics/english-housing-survey-2021-to-2022-energy/english-housing-survey-2021-to-2022-energy**

2.2.3. Heat demand

An accurate estimation of heat demand (i.e. how much heat buildings need) is essential for ensuring the ability of your project to meet the community's heating needs. To be successful the project must be able to meet current and expected heat demand in a reliable way.

The heat demand will vary depending on the type of property and occupants. A good way to start would be to look at the Energy Performance Certificate (EPC) of the properties.

It is important to consider that the heat demand figures in EPCs are calculated according to a standard method that does not reflect user behaviour, and are also often outdated or missing for properties. Utility bills or meter readings can also be used to reflect user behaviour.

A few things to consider when it comes to getting an idea of wider heat demand in your area are:

- Is there any big industry in your area, or other consumers with high potential heat demand?
- What is the split of residential and non-residential buildings in your community? Non-residential customers may have a different pattern of heat usage.
- What is the proportion of different heating systems used in your community?

Possible, a climate change charity, has a useful toolkit for considering heat demand, that you can view **here**.

3. The next steps

In this section, we start to explore the more detailed aspects of developing a community heat project. Here, we delve into the technical and financial aspects, legal requirements, grid considerations, and financing options that will help to shape the project's viability and success.

While this guide provides a starting point for these considerations, it is likely that you will need to undertake specific research on each of these aspects in order to ensure the success of your project.

3.1. Technical and financial feasibility

A comprehensive technical feasibility study is a crucial step in the planning and implementation of a successful community heat project. A technical feasibility study is likely to involve the following:

Outlining exactly what you want to do

Clearly define the goals, scale, and scope of the community heat project. Identify the targeted area (including project size), expected energy demand, and intended benefits.

Collecting information

Gather essential data on the existing housing stock (see **section 2** of this guide), energy consumption patterns, and local energy sources.

Understanding energy demand

Analyse historical energy consumption data and patterns to understand peak demand periods and variations. This analysis informs the sizing and capacity requirements of the community heat system.

Choosing the right technology

Evaluate available community heat technologies considering their suitability for the size, location and aims of your proposed project. Identify the most suitable energy sources for the project, considering local availability, cost-effectiveness, and environmental considerations. This may include developing plans for renewable energy generation alongside the heat project.

Understanding the area

Examine the existing infrastructure, including heating systems, distribution networks, and potential connection points for the community heat system.

Designing your network

If a communal project, design the distribution network that will deliver heat to the buildings. Evaluate different layouts, pipe sizes, and routing options for optimal efficiency and minimal heat loss. For some projects, you may also need to consider the location of an 'energy centre' to house key equipment. For this, you will need advice from a heating expert.

Understanding the costs and benefits

Conduct a cost-benefit analysis study to compare the costs and benefits of a potential project. This study will likely consider the initial investment, operational costs, potential energy savings and long-term returns on investment. The study should help a decision to be made regarding whether the project is viable.

Understanding planning and permitting requirements

Consider any planning or permitting requirements that may be required for your project to proceed (please see **section 3.1** for some of these considerations).

You may want to consider employing a sustainability consultant (or similar professional consultant) to undertake the feasibility survey. See **section 3.4** of this guide for sources of funding that could be applied for to help cover the costs of feasibility studies.

The results of a technical feasibility study could be shared with the community, for example at a community engagement event. Here it will be important to get community feedback and to make sure they are happy with the proposed project design.

Consent and legal requirements

Once the design for the system is complete, then you will need to determine what consents will be required for the scheme and start engaging with key stakeholders and third parties as part of the process for securing consents.

Depending on the type of project, the following consents may be needed:

- **Agreement from participating households/businesses**
- **Planning permission**, depending on the scale and nature of the project, you may need permission from the local authority
- **Highways**, need permitting
- **Landowners**, including the highways authority if the project crosses their land
- **Building regulations** if undertaking work to a building
- **Energy supply license**, needed if you plan to generate, supply or distribute energy, not always necessary for heat networks, which are currently unregulated
- **Grid connection agreement**, depending on the scale of the project you will have to either complete a connection for prior to installation, or within 28 days after
- **Environment agency consent**, if installing a water source heat pump
- **Connection/supply agreement**

Network

Network infrastructure can play an important role in the success of a community heat project.

Ensuring that the grid is able to accommodate the increased energy demand and distribution needs of a community heat system is essential.

Working in collaboration with the Distribution Network Operator (DNO) is an important aspect of successfully implementing a community heat project.

The DNO manages the local electricity distribution network and plays a significant role in ensuring that your project integrates seamlessly with the grid infrastructure.

The following aspects should be considered.

Grid capacity and compatibility:
Can the grid handle the increased load generated by the proposed community heat project?

We suggest contacting your local Distribution Network Operator to find out about the availability at your local substation. For example, If you are located with the National Grid region then you can take a look at National Grid Electricity Distribution's capacity map **here**.

Compliance with regulations:
Is your community heat project aligning with local regulations and grid connection requirements?

CASE STUDY

Heat Upper Heyford

Type of project: Village heat network supplied by either ground or air source heat pumps.

Stage of project: Feasibility

Project website: heatupperheyford.wixsite.com/website/home-1

Funding received: Rural Community Energy Fund (RCEF)

In August 2021, with proven village interest and support, Heat Upper Heyford and Upper Heyford Parish Council successfully received a feasibility grant from RCEF and commissioned Avieco to undertake a detailed survey and extensive engineering plan and financial modelling for the scheme.

Avieco found that the scheme is viable and recommended applying for a detailed Phase 2 investigation.

The proposed project is for a high temperature (72°C) heat network, supplied by either ground or air source heat pumps.

The RCEF Phase 2 grant is enabling the development of a detailed specification of the scheme including individual household requirements and a test borehole.

3.2. Finance

Financing is a crucial aspect of bringing your community heat project to life. While the upfront costs may seem daunting at first, various funding sources can help make your project financially feasible.

Most projects that have progressed so far have been made possible with grant funding. While we recommend seeking expert financial advice, you may wish to consider the following sources of funding:

Grant funding
Explore available grants from local and national government. See **section 3.4** of this guide for suggestions of available grant funding.

Community investment
Consider if direct community investment could help finance your project. This may involve a community share offer enabling individual community members to buy shares in the project.

Green loans/financing
Explore financing options from financial institutions that specialise in financing renewable energy projects.

Project partnership
Financing may form part of a partnership with a local authority or industry partner/utility company (see **section 4** of this guide).

3.3. Business model options

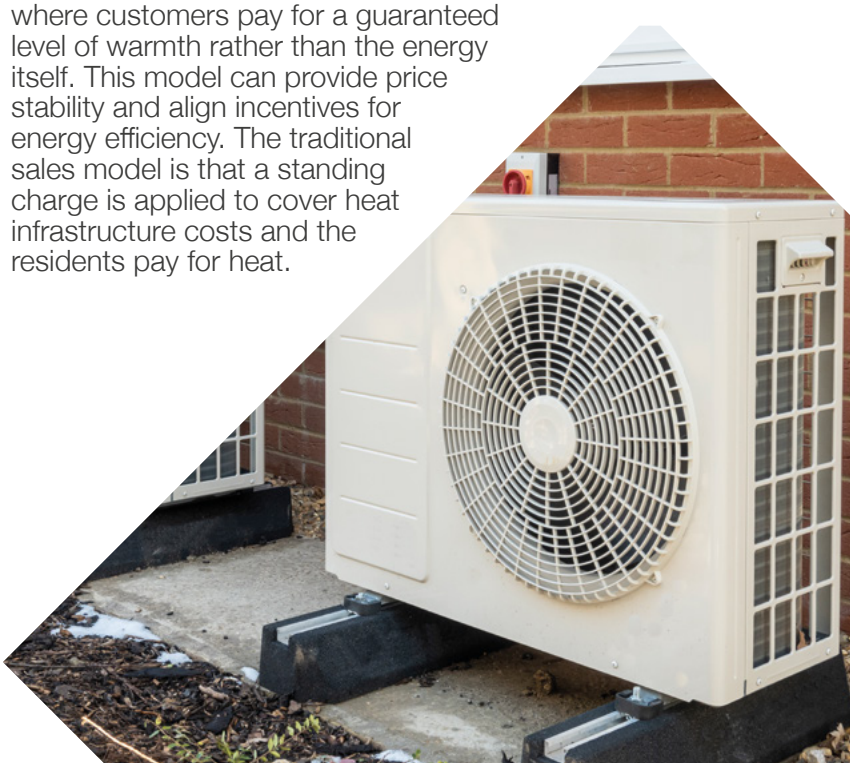
There are a range of different business models that you could consider for your heat project. While we recommend seeking expert advice on this aspect, you may want to consider the following types of business model:

A Community Benefit Society
In this approach, residents and businesses would collectively own and manage the community heat system. The local community could establish a new, local Community Benefit Society (CBS) if there is not an existing CBS. The CBS would enable a share offer to be launched, giving community ownership for the scheme. This approach could potentially put a lot of work on local volunteers, unless funding is obtained for additional support. However, profits could be reinvested in the project or on other community benefits.

An Energy Services Company
An Energy Services Company (ESCo) (which could involve a local authority and/or community energy organisations with a common goal), will agree to supply heat to the customers (domestic and/or commercial). The ESCo will build and operate a district heating system and supply the heat. The ESCo may supply a defined set of buildings or have an agreement to supply heat to developments within a defined area. Revenue is generated from heat sales. There are also forms of ESCO partnerships either with a utility company or a developer.

Utility-owned model
This involves directly partnering with a utility company who will own and operate the heat project. The utility company will bill customers for their heat consumption.

Heat-as-a-Service (HaaS)
This involves offering heat as a service, where customers pay for a guaranteed level of warmth rather than the energy itself. This model can provide price stability and align incentives for energy efficiency. The traditional sales model is that a standing charge is applied to cover heat infrastructure costs and the residents pay for heat.



CASE STUDY

Chipping Community Energy

Type of project: Ground source heat, shared boreholes

Stage of project: Early design stage

Project website: chippingcommunityenergy.co.uk/project

Funding received: Rural Community Energy Fund (RCEF)

Chipping Community Energy are aiming to develop a phased, affordable and inclusive community-scale low carbon energy solution for the village, (a cluster of approximately 300 off-gas grid households) and wider rural community.

It involves the organisation working with Prospus Group and the North West Energy Hub and proposes installing community-owned boreholes to supply ambient ground heat to properties open to adopting ground source heat pumps. The community would finance, install and operate the borehole and the homeowner would get access to this ambient heat for an annual standing charge, but would not have to contribute to the costs of the borehole.

To help minimise the standing charge and energy costs to consumers, the scheme is also looking to use local renewable generation and community scale energy trading. The end goal is to create an offer for the residents of the village that provides them with the most affordable energy solution and reduced carbon emissions.

The work completed up until summer 2023 includes heat demand surveying for the village, collating energy data, engagement and studies to compare a range of technological solutions.

By August 2023, 73 dwellings had indicated an interest in the project, with energy surveys completed on 20 dwellings.

CASE STUDY

Net Zero Terraced Street (Rossendale)

Type of project: Ground source heat, shared boreholes

Stage of project: Design stage

Project website: rvenergy.org.uk/decarbonising-rossendale/

Funding received: Rural Community Energy Fund (RCEF)

The Net Zero Terraced Street project is a collaboration between community organisation Rossendale Valley Energy, Rossendale Borough Council and a range of other groups including Buro Happold, Electricity North West and Centre for Energy Equality.

Rossendale is a borough within Lancashire with a considerable amount of terraced housing.

The alternative decarbonisation solution for this type of housing would be electric boilers, which without fabric retrofit, would considerably increase bills. The alternative option of air source heat pumps was ruled out by space and noise constraints.

The project is looking at the option of shared ambient loop heat clusters that provide the opportunity for more efficient community heating.

This would be shared boreholes in the street and ground source heat pumps in each individual home connected to these boreholes.

This would mean that residents could benefit from a heat pump even if they don't have the space for an air source heat pump. It would also mean the retrofit of the house and the digging of the boreholes would be paid for through a standing charge, as opposed to the cost being put on each individual household.

3.4. Potential sources of funding

When planning a project, you should look out for any potential sources of funding either from national or local government. The following funding sources were available at the time of publication.

Green Heat Network fund (England)

The UK Government has a **Green Heat Network** fund available for the development of new and existing low-carbon heat networks.

This includes opportunities for community energy organisations to work alongside local authorities.

The GHNF is open to organisations in the public, private and third sectors in England. This funding only applies to schemes of 200 or more houses (or 100 if the area is off the gas grid).

Community Energy Fund (England)

The UK government has a new £10 million **Community Energy Fund** for rural and urban community energy projects in England.

The information provided at the time of writing states that this funding will be available for both feasibility studies and to fund feasible projects.

Boiler Upgrade Scheme (BUS)

The UK Government's **Boiler Upgrade Scheme** provides grants of up to £7,500 per installation of an air source heat pump in England and Wales. This only applies to individual heat pumps. Other eligibility criteria apply.

Heat Network Efficiency Scheme

The UK Government **Heat Network Efficiency Scheme** provides funding for public, private and third sector organisations in England and Wales to improve the performance of existing heat networks.

The scheme will provide funding to make improvements to existing district heating or communal heating projects that are operating sub-optimally. The scheme will provide up to 50% funding for capital works, and up to 100% funding for optimisation studies.

Local authority funding

It is worth speaking to your local authority to see if they have any funding available. For example, in Swaffham Prior, funding for the initial feasibility study was provided through the Cambridgeshire and Peterborough Combined Authority.

Where to look for other funding opportunities

For groups in Wales, we recommend looking at the **funding opportunities shared by Community Energy Wales**.

For groups in England, we recommend looking at the **funding opportunities shared by Community Energy England**.

4. Working together

Collaboration is key in the development of community heat projects. This can involve bringing on board contractors and businesses with the necessary skills.

It could also involve creating partnerships for the project such as with businesses or local authorities. Such partnerships can provide both funding and specific knowledge/skills.

4.1. Working with local authorities

One way of developing a community heat project is through partnering with local authorities. This is what Swaffham Prior Community Land Trust did.

The best way to start this approach is to reach out to your local authority early on in the development process to see if they would be interested in working together and from there to discuss the form of partnership that may be possible. There are different ways of working together.

This could involve:

- **Local authority ownership of the heat project infrastructure:** this is the model used in Swaffham Prior (see below). This approach can reduce the cost for community organisations. It can also make things easier for the community organisation. For example, the local authority can be responsible for the operation and maintenance of the infrastructure, as well as the customer services such as billing.
- **Local authority support with capacity or funding:** a local authority may have funding available to support community level projects. They may also be able to provide direct support, such as helping to develop the project plans.

CASE STUDY

Swaffham Prior: The first village to develop a rural heat network

Type of project: Heat network **Stage of project:** Operational

Project website: cambridgeshire.gov.uk/residents/climate-change-energy-and-environment/climate-change-action/low-carbon-energy/community-heating/swaffham-prior-heat-network/about-swaffham-priors-heat-network

Funding sources: The project achieved funding for a feasibility study through the Cambridgeshire and Peterborough Combined Authority. Following the feasibility study, the project made successful applications to BEIS Heat Network Development Unit (HNDU) and Heat Network Investment Project (HNIP). Cambridgeshire County Council also made a strategic investment in the project.

The Swaffham Prior Heat Network project was initiated by Swaffham Prior Community Land Trust in order to address the village's reliance on oil for heating and provide cheaper renewable heating to as many homes as possible.

The project involved the Community Land Trust collaborating with the Local Authority, Cambridgeshire County Council, to design a community heating network.

The rural heat network involves a mix of air source and ground source heat pumps with capacity to supply 1.7 MW of heat to 300 homes.

Cambridgeshire County Council own the energy company and heat network assets. They are responsible for the operation and management of the heat network, as well as the customer services and billing to customers.

4.2. Working with industry partners

Another approach to partnership working is to partner with an industry partner. The benefit of this approach is that they are likely to have the detailed expertise of the sector as well as necessary resources.

The choice of industry partner is likely to depend on the type of project that you are proposing. It may be worth waiting until you have the project feasibility study undertaken and have the support of community members before approaching an industry partner.

CASE STUDY

CommuniHeat Project, Barcome

Type of project: Net zero carbon village

Stage of project: Community engagement

Project website: communiheat.org/barcombe

CommuniHeat
PATHWAY TO NET ZERO

Barcome is an off-gas grid village, with the aim of becoming a net zero carbon emission village.

CommuniHeat is a partnership between the people of Barcombe, local community energy group Ovesco, engineering practice Buro Happold and electricity network operator UK Power Networks.

Together the partnership is developing a plan for the village to transition from using heating oil to low carbon heat pumps and potentially other technologies such as solar panels.

The project aims to provide heat to approximately 700 homes and develop a model of community ownership that can be scalable in other areas. There has been an ongoing period of community engagement and data collection including, attending community events, online and in person questionnaires and home surveys.

CommuniHeat will use the data from Barcombe to feed into modelling exercises which look at electricity network infrastructure requirements, local energy generation, viable heating options and ways to finance a low-carbon heating solution for Barcome.

CASE STUDY

Bristol Heat Network

Type of project: City-scale heat network

Stage of project: Ongoing

Project website: bristolcityleap.co.uk/heat-networks

Vattenfall Heat UK are working with Bristol City Leap to expand the existing heat network in Bristol City Centre, develop new networks and ultimately interconnect them to create a single Bristol Heat Network.

The heat network will provide a huge amount of the heat needed in locations such as Redcliffe, Old Market, Bedminister and the city centre.

The heat network will have an option for community organisations to get involved, either through generating their own low carbon heat or renewable electricity and connecting to the network, or through separate community heat projects.

These opportunities will be supported by at least £750,000 in a community fund across five years, which will finance feasibility studies.

The Bristol Heat Network is a good example of projects being done on a scale that would be very difficult for communities to originate themselves, but still offering opportunities for participation.

CASE STUDY

Kensa Utilities
A KENSA GROUP COMPANY

HM Government

European Union
European Regional Development Fund

Heat the Streets, Kensa

Type of project: Street-by-street, ground source heat pump deployment

Stage of project: Operational

Project website: heatthestreets.co.uk

Funding source: ERDF

The Heat the Streets project was run by Kensa Utilities between June 2021 and June 2023. It involved a street-by-street approach to ground source heat pump deployment.

Stithians village was chosen due to its favourable geology and as it was also off the gas network. The project involved installing ground source heat pumps in new and existing homes and connecting the ground source heating systems to Shared Ground Loop Arrays, a communal network of underground pipes that extract renewable heat via boreholes.

98 homes have been fitted with ground source heat pumps and 22 enabled for future connection. The ground source heat pumps provide 100% of the properties heating and hot water. The project was 5x over-subscribed.

Kensa Utilities funded and retain ownership of the heat network, charging consumers a low monthly charge to use it, reducing the upfront cost of ground source heat pumps for consumers.

While this is an industry-led project, it provides a useful example for community organisations.

5. What next?

5.1. Next steps

Once you've decided on the project and the business model (this may be an iterative process) then it's time to get the project into motion.

The following steps may be taken, many of which may require specialist advice:

Design: concept level

- Confirming any land requirements for the projects
- Testing, e.g. for boreholes if ground sourced heat
- Detailed understanding of any planning or other requirements
- Finalising the financial model
- Ensuring the community are on board with the concept

Design: detailed

- Detailed project design including confirmation of properties involved
- Agreement of any contract terms
- Confirmation of who will be responsible for ongoing maintenance as well as other project roles
- Submission of planning application if needed

Commercialisation

- Signing of contracts with customers and with delivery partners

5.2. Checklist

Topic	Things to think about
Understand your technology options	• Make sure you understand the different low carbon heating options available to you
Understand typical types of community heat project	• Do you or any of your team have any experience in any of these types of projects? • Can you get in contact with other community energy organisations developing projects to understand their experiences?
Speak to your neighbours	• How do you think your community would like to be involved? • What harder to reach groups do you have in your area? • How can you keep your community involved as your project progresses?
Understand your community's housing	• What's the split of residential/non-residential buildings in your area? • Are there are a lot of new builds in your area? • What types of properties are in your community?
Understand local heat demand	• Is there any big industry in your area? • Can you access data about local heat demand?
Undertake a feasibility study	• Can you obtain grant funding for feasibility study? • Can you hire a consultant to undertake a feasibility study?
Search for relevant funding	• Are there any funding opportunities at a national or local level
Consider project partners	• Have you got a developed project idea and community members on board ahead of contacting potential partners? • Is the local authority interested in partnering? • Are there industry partners that you could approach?
Obtain relevant consents	• What consents do you need to obtain?

6. Further support

6.1. Learning from other projects

As community heat projects are fairly new, there is a need for community organisations to learn from each other. This includes sharing what may not have worked as well as successes. The following resources provide useful information on existing and emerging projects.

6.1.1. Community Energy England Working Group on Heat

Community Energy England hold a working group on community heat, to share ideas and experiences. To join this group please email Duncan Law, Head of Policy and Advocacy at Community Energy England. (**d.law@communityenergyengland.org**)

6.1.2. Video case studies

The following videos are available online, showing the experiences of community heat projects.

Resource	Link
Are Rural Community Heating Networks Sustainable? (Swaffham Prior) webinar recording	youtube.com/watch?v=i7aCrewdwoQ
CES Masterclass on Community Heat	youtube.com/watch?v=k6NYBTu2A0Q
Community Energy England webinar recording: 'Heat Decarbonisation: Opportunities, Challenges and Cooperation'	youtube.com/watch?v=D7WoX2FRRM0
Community heat networks - learning from others making it happen	youtube.com/watch?v=303JifVYX9s
HEAT: Communipower, Decarbonising Rossendale & the Chipping Project	youtube.com/watch?v=lyXF36lWpDg
Everything Electric Show visiting Heat the Streets by Kensa	youtube.com/watch?v=6Ey9RPa5glM
Chipping Community Energy heat network project - Community Scale Low Carbon Heat Forum	youtube.com/watch?v=j-W4zmD9EDc
Kensa Contracting and Thurrock Council replacement of night storage heaters in three social housing high-rise tower blocks with ground source heat pumps.	youtube.com/watch?v=NxAa6VnxVTA&t=280s

6.2. Additional resources

The following resources may provide useful information:

Resource	Link
Carbon Trust: Options appraisals for heat pump retrofit in 15 London buildings	https://ctprodstorageaccountp.blob.core.windows.net/prod-drupal-files/documents/resource/public/Options-appraisals-for-heat-pump-retrofit-15-London-buildings_0.pdf
Centre for Sustainable Energy: Community Retrofit Guide	https://www.cse.org.uk/resource/community-retrofit-guide/
Community Energy England: Energy efficiency & fuel poverty	https://communityenergyengland.org/how-to-pages/energy-efficiency
Community Energy London: Retrofitting Heat Pumps in London's Community Arts and Leisure Buildings	https://www.communityenergy.london/cel-publications/
Community Energy London: Step by Step Project Guide	https://www.communityenergy.london/step-by-step-project-guide/
Introduction to heat as a service	https://es.catapult.org.uk/report/ssh2-introduction-to-heat-as-a-service/
Greater London Authority Low carbon heat: heat pumps in London	https://www.london.gov.uk/sites/default/files/low_carbon_heat_-_heat_pumps_in_london_.pdf
London Energy Transformative Initiative (LETI): Climate Emergency Retrofit Guide	https://www.leti.uk/_files/ugd/252d09_c71428bafc3d42fbac34f9ad0cd6262b.pdf
People Powered Retrofit: Home Retrofit Scenarios	https://ppr-website.s3.eu-west-2.amazonaws.com/uploads/PPR000_Anonymised-Report-June-2023-PUBLIC.pdf
Possible: Keys for assessing heat demand for a renewable heating project	https://www.wearepossible.org/parks-toolkit/5-investigating-heat-demand
Retrofit for All: Toolkit	https://cc-site-media.s3.amazonaws.com/uploads/2021/04/Retrofit-For-All-Toolkit.pdf
UKERC: Net Zero Neighbourhoods	https://ukerc.ac.uk/project/net-zero-neighbourhoods/

National Grid Electricity Distribution plc
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United Kingdom

nationalgrid.co.uk

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