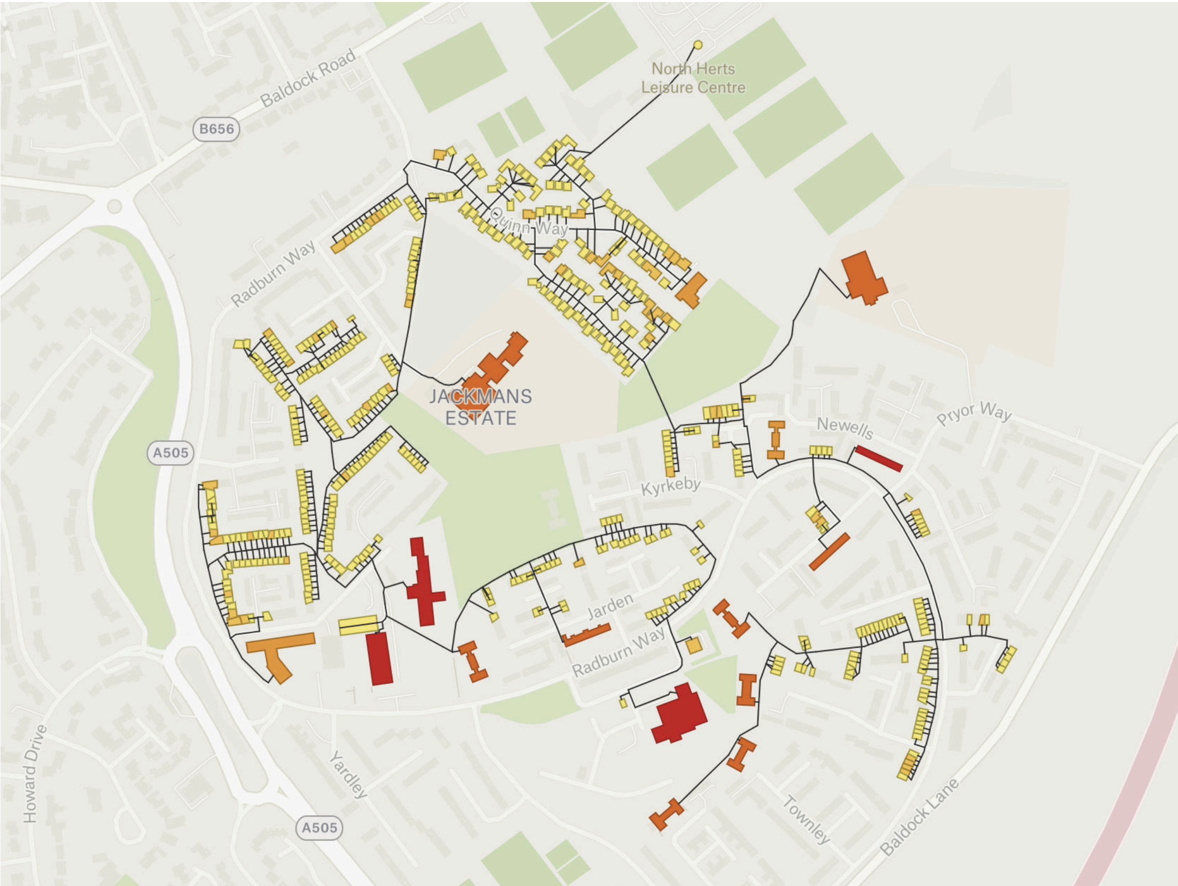
Community Heat Development Unit

Letchworth Heat Network Case Study



A Report on behalf of

River Ivel Community Energy Limited

Funded by the Energy Redress Scheme

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Power and Energy Units

Term	Description
kW	Unit of power.
kWh	Unit of energy. For example a 3kW kettle running continuously for 1 hour consumes 3kWh of electrical energy.
MWh	1,000 kWh
GWh	1,000,000 kWh

1. Executive Summary

1.1. Introduction

The Community Heat Development Unit (CHDU) is an ambitious research and innovation project led by Sharenergy and funded by the Energy Redress Scheme that aims to jumpstart a wave of community owned low carbon heat networks in the UK. The focus of the CHDU[1] project is on centralised district heat networks inspired by the Bishop's Castle Heat and Wind project led by Lightfoot Enterprises[2] and Shropshire and Telford Community Energy[3].

Following a process of techno-economic modelling and a nationwide site search to identify locations which are best suited to district heating, the Jackmans Estate area of Letchworth was identified as a location to investigate further. This area is of particular interest since much of the housing stock are high density blocks of flats, with minimal outdoor space, and terraced houses, 40% of which is social housing. There are also a range of potential non-domestic anchor loads in the area including multiple schools and a leisure centre.

Much of the area has relatively low indices of multi-deprivation compared to elsewhere in the country suggesting that residents have limited means of funding installation of a low carbon heating system on an individual basis. This is part of the reason that a heat network has been investigated within the estate since a network may be able to attract external investment, enabling decarbonisation of households' heating systems without requiring them to front the installation costs.

This case study reports on the potential for a community owned heat network in Jackmans Estate, Letchworth, focusing on a model where most of the heat is supplied by large ASHPs with much of their electric demand met by a nearby wind turbine.

1.2. Proposed Low Carbon Heat Network

The proposed low carbon heat network aims to provide around 90% of the annual heat demand of connected buildings using a large 1.69MWhth ASHP with

[1] https://communityheat.org.uk
[2] https://lightfootenterprises.org/heat-network/
[3] https://stcenergy.org.uk

10% of the heat being supplied by gas back-up boilers. The heat sources would be installed alongside a 400m^3 hot water tank to store heat when it can be produced cheaply for use later.

It is necessary to reduce the cost of electricity consumed by the ASHP as much as possible to improve the financial viability of the network. Wind generation correlates well with heat demand, as it tends to be windier during the colder months when heat demand is higher. The proposed scheme includes the development of a ~3MW onshore wind turbine to supply around 85% of the electricity consumed by the ASHP. This wind turbine would supply electricity to the ASHP and potentially generate additional income via sales of excess electricity to North Herts Leisure Centre and export to the electricity network. The wind turbine could potentially be located towards the east of the network site. The wind turbine would be owned and operated as part of the heat network scheme. Allowances have been made for the costs associated with connecting the wind turbine to the grid however a grid connection application needs to be submitted to UK Power Networks to fully understand the costs and timescales involved.

Customers joining the scheme during the initial phase of construction would be offered a connection with no upfront costs. The scheme would charge customers for their heat usage in a similar manner to how gas and electricity is supplied. Customers would be charged an annual standing charge, roughly equivalent to the annualised costs of maintaining and replacing an individual gas boiler, and a unit price for heat consumed which would be metered on a per property basis. The overall price of heat would be comparable to the cost of heating a home using a boiler running on mains gas.

The main benefits to customers joining the scheme are insulation against the spikes in the global gas markets experienced in recent years and an investment free opportunity to decarbonise their heating. Centralised district heat networks also offer a low-hassle means of decarbonising domestic heating since they require little interference to the heating system within a home: all that is required is for the existing gas boiler to be switched for a heat interface unit and connected to the pipework main in the street. The scheme takes care of the maintenance of the network and heat interface units. There is an additional benefit that customers can disconnect from the gas network and hence save on paying the daily gas standing charge, provided they have no other appliances which require gas.

1.3. Financial Performance

1.3.1. Summary

The scheme revenues are generated from heat sales and standing charges paid by heat network customers, the sales of local wind generation to North Herts Leisure Centre and from the export of excess wind generation, not consumed by the heat network heat pumps or leisure centre, to the electricity network.

The assessed heat network scheme assumes 825 domestic properties and two schools located in Jackmans Estate join the heat network scheme. The scheme had originally intended to also supply heat to North Herts Leisure Centre, a significant anchor load, however during the course of this project North Herts council were awarded funding[4] from the Public Sector Decarbonisation Scheme (PSDS) to improve the energy efficiency of the facility and change their heating system from gas CHP to ASHPs.

With an estimated 25 year project IRR of 4.8%, less than the cost of finance, on a capital investment of £23.1m the proposed scheme is not financially viable. The annual income received by the scheme is not enough to fund the annual loan repayments and operation and maintenance costs, hence the scheme is unable to achieve an initial payback period within the first 25 years of operation.

These figures assume an average cost of £4,881 to connect each building to the network, which relies on the implementation of plans to extend the Warm Homes scheme to fund heat network connections. The availability and limitations of grant funding from the Warm Homes scheme is discussed further in section 9.2 of this report.

These figures assume that a capital grant of 26% of the total heat network and wind turbine capital costs can be awarded by Green Heat Network Fund, based on a rate of 4.5p/kWh of heat delivered over the first 15 years. This is equivalent to 36% of the capital costs of the heat network components (excluding the wind turbine). It is currently unlikely that the scheme could receive this level of grant funding since the competitive application process favours schemes focussed on

[4] https://www.north-herts.gov.uk/leisure-centre-decarbonisation-project

non-domestic properties which have had alternative pots of grant funding available to fund large connection fees e.g. the Public Sector Decarbonisation Scheme[5]. This is despite the proposed scheme achieving carbon emissions which are 50% less than the GHNF threshold, pushing up to 4.1 GWh of gas generated electricity off the grid due to exported wind generation and delivering significant social value through community ownership.

1.3.2. Building Connection Costs

A significant source of capital costs in a domestic focussed heat network project, are the costs of connecting properties to the trenched and buried network pipework. Estimates by Buro Happold[6] suggest that the cost of connecting a domestic house to the network could be ~£9,000 in 2025 prices. It may be possible to reduce this base connection costs to less than £9,000 by streamlining the installation process for the common housing types in the estate and by using local trades people. If plans are pursued to extend the Warm Homes scheme to fund the connection of eligible properties to a low-carbon heat network, it is anticipated that the average cost of connecting properties in Jackmans Estate to the network could be reduced to £4,881. However, the scheme is not predicted to be financially viable even at this lower connection cost.

The proposed heat network scheme would become financially viable if the UK Government's Boiler Upgrade Scheme[7] were extended to fund the connection of domestic properties to the network. Access to this grant funding, £7,500 per property, to support homes not eligible for funding from the Warm Homes scheme, would reduce the average cost of connecting a domestic property to the network to £1,281. Assuming this lower connection cost and a GHNF grant equivalent to 4.5p/kWh, the 25 year IRR of the scheme is predicted to be 7.1%, with an initial payback period of 23 years, and an estimated surplus of £2.8m after 25 years.

1.3.3. Equipment Purchase Loan Term

The base case financial model assumes that loans used to purchase heat network equipment (ASHPs, network pumps, thermal storage, HIUs etc) and the wind

[5] https://www.gov.uk/government/collections/public-sector-decarbonisation-scheme

[6] https://www.usdn.org/uploads/cms/documents/161214_-_connecting_existing_buildings_to_dhns_-_technical_report_00.pdf

[7] https://www.gov.uk/apply-boiler-upgrade-scheme

turbine have a term of 25 years, which is aligned with their expected lifetimes. Purchase and installation of the heat network pipework is funded using a loan with a 50 year term. Heat networks are long term projects, with the lifetime of the pipework expected to be at least 50 years. During the early years of the project, the annual costs borne by a heat network scheme are typically dominated by the costs of repaying the loans (which fund the construction of the network). Later in the project lifetime, the inflation linked income streams are anticipated to significantly exceed the loan repayments, assuming the loans are paid as an annuity.

The loan repayments during the early years of the heat network could be reduced if the heat network equipment, wind turbine and network pipework could all be financed using loans with terms of 50 years. This would result in lower annual loan payments assuming the loan is modelled as an annuity. If this were the case, the proposed heat network in Jackmans Estate would be financially viable, achieving an initial payback period of 44 years and a 50 year IRR of 6.4%. This assumes an average cost of £4,881 to connect each building to the network and a GHNF grant equivalent to 4.5p/kWh.

1.3.4. Summary of Scenarios

Summary of Scenarios			
Wind Turbine Power Rating	3MW	3MW	3MW
BUS Grant per Eligible Property	£0	£0	£7,500
GHNF Grant Amount (4.5p/kWh)	£6,023k	£6,023k	£6,023k
Equipment Loan Term	25	50	25
Average Connection Cost	£4,881	£4,881	£1,281
Year 1 Loan Repayment	£1,229	£1,003	£958
Year 1 Cashflow	-£191	£35	£80
Initial Payback Period	N/A	44	23
25 Year Project IRR	4.8%	4.8%	7.1%
50 Year Project IRR	6.4%	6.4%	8.1%

1.4. Governance

If the scheme progresses a new Community Benefit Society (CBS) would need to be set up to own the wind turbine and manage the Scheme. A CBS would enable a share offer to be launched ensuring community ownership of the Scheme, including the wind turbine. It is anticipated that this CBS would contract out much of the development, operation and maintenance activities to skilled contractors, while ensuring local ownership and governance.

If a local CBS were to develop a heat network in Letchworth, they will need a high degree of support. We envisage a federated system where multiple individual societies are supported by a specialised centralised development, advice and administration service with the addition of well supported peer to peer learning between the societies. Unfortunately, we do not think the time is right for setting up this centralised service at this point as options for viable heat networks are so limited. However, the ideas for such a service developed as part of this project should be further developed for the future.

1.5. Supply of Local Electricity

The CBS could also act as a license exempt Class A Small Supplier[8] to benefit from the recent BSC P442 Modification[9] which can enable some cost savings (expected to be up to 5p/kWh) when wind generation exported to the grid is matched to consumption on a half hourly basis. Benefit is limited to Class A Small Suppliers who supply up to a maximum of 5MW of electricity (or 2.5MW if supplied to domestic customers).

Additionally, if the P441[10] modification to the local energy trading rules is approved, the CBS, acting as a Small Supplier, could also potentially supply a significant proportion of Jackmans Estate with low-cost electricity alongside the heat network. This is because most of Jackmans Estate is supplied by the same primary substation and is expected to be considered "local" to the proposed wind turbine following implementation of P441. This would strengthen the scheme's revenue stream and, by reducing the cost of purchasing locally

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[8] UK Government, (2001). The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001

[9] Ofgem, (2024). https://www.ofgem.gov.uk/decision/approval-bsc-modification-p442

[10] Ofgem, (2024). https://www.ofgem.gov.uk/decision/dcp441-proposal-increase-number-allowed-change-report-alternative-variations-two-three-authority-decision

generated electricity, potentially enable customers who are not located on the heat network route to decarbonise their heating using individual heat pumps.

1.6. Conclusions and Next Steps

A centralised heat network is proposed which aims to deliver an affordable solution to decarbonising the heating of both domestic and non-domestic properties. The scheme would supply heat through a centralised energy centre connected to a local distribution network, and either sell surplus electricity to North Herts Leisure Centre or export it to the national grid. This provides a dual revenue scheme: stable income from long-term heat supply agreements and additional income from sales of wind generated electricity which is not consumed by the network heat pumps. The proposed Jackmans Estate heat network is projected to reduce carbon emissions from heating for those joining the scheme by 85%.

North Herts Leisure Centre has received funding from the PSDS to replace its existing gas CHP system with ASHPs meaning the building will not be a heat customer of the proposed heat network scheme. The scheme is not expected to be financially viable without the leisure centre acting as an anchor load. This is despite the combination of significant lengths of soft dig reducing the cost of installing the pipework (it is predicted that only 55% of the network length would be installed in the highway) and high density of housing in the form of blocks of flats. Moreover, the cost of connecting properties to the heat network pipework that is borne by the heat and wind scheme may be partially funded by the Warm Homes scheme due to the large proportion of social housing and/or low income households in the area.

It is estimated that the proposed heat network scheme would be financially viable if the Boiler Upgrade Scheme were extended to fund the connection of domestic properties to low carbon heat networks, or loans for the pipework, energy centre equipment and wind generation could be secured against 50 year terms. Alternatively, developing a better understanding of the main capital costs required to develop the proposed low-carbon heat network scheme for the specific network route and housing stock in Jackmans Estate may improve the scheme's financial case. Specifically, it is recommended that quotes for purchasing and installing the network pipework are requested to fully understand the extent which could be installed as "soft dig", and alternative options for retrofitting the specific building stock in the estate to the heat network are investigated.

While development of the proposed heat network is not currently financially viable, a number of potential wind sites have been identified in the area. A wind only project may be viable which generates income from selling behind the meter electricity to North Herts Leisure Centre, exporting any excess generation to the national grid. It is anticipated that a local wind project would become increasingly viable if the P441 modification to the local energy trading rules is implemented and may be able to reduce the electricity bills of residents of Jackmans Estate using an Energy Local style approach. Local advocates for such a scheme should get in touch via chdu@sharenergy.coop to register their interest and continue discussions about how a scheme could be progressed.

2. Community Heat Development Unit Project

2.1. Overview

The Community Heat Development Unit (CHDU) is an ambitious research and innovation project led by Sharenergy and funded by the Energy Redress Scheme that aims to jumpstart a wave of community owned heat networks in the UK.

The experience of community heat network projects in the UK is that many are suggested, but few are successful. We want to bring a data-led approach to identifying where the best chances for successful community heat networks are – drawing on work that has already been done but adding the crucial element of community ownership that is Sharenergy's specialism.

This 18-month project focussed on identifying possible locations where a domestic focussed low-carbon heat network could operate and developing a business model that can operate in these 'sweet spots', as well as a Community Heat Delivery Unit to support the development of locally-owned networks. More information about the CHDU project is available online at https://communityheat.org.uk.

2.2. Site Identification

A site search across mainland GB has been conducted to identify the most feasible locations where a centralised heat network incorporating large air source heat pumps and on-site renewable electricity generation could be developed. Specifically, these are areas the CHDU techno economic model has identified as being able to generate enough income through sales of heat and electricity to pay off the loans required to finance the projects.

The sites identified during this process were correlated with locations of existing community energy organisations who were interested in collaborating on a heat network project.

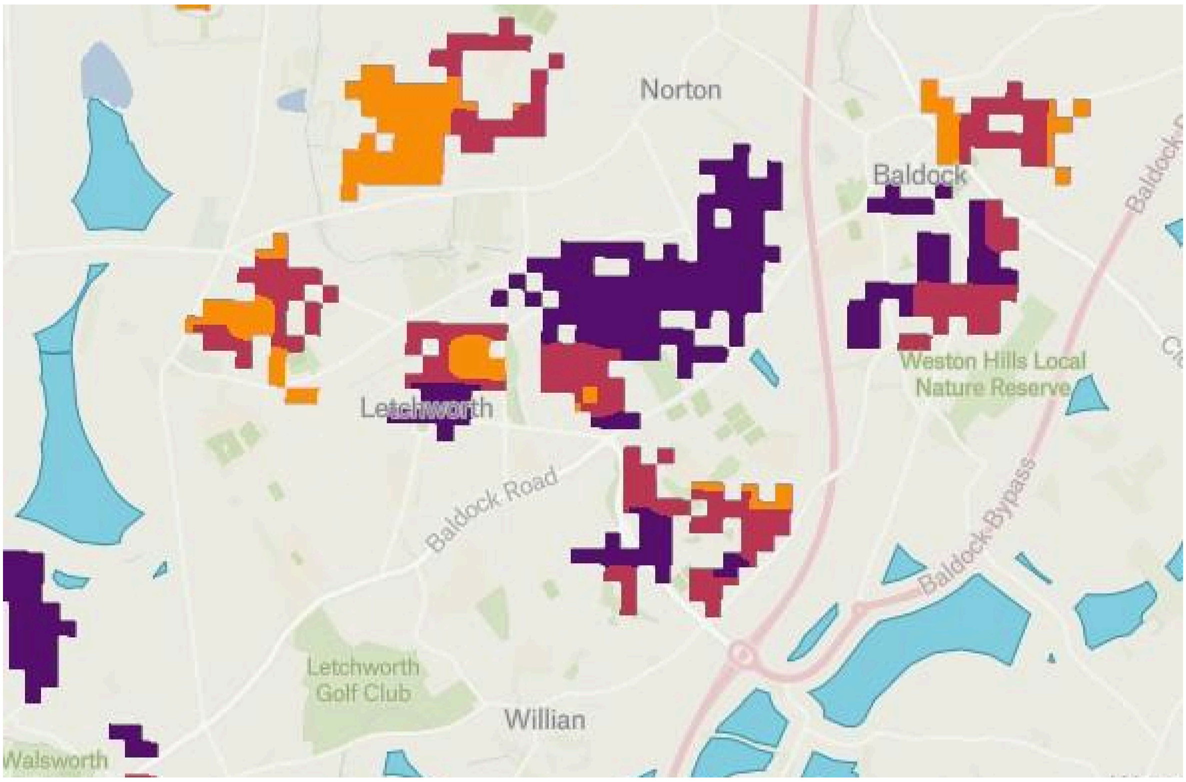

Figure 1: Potential network locations (yellow-purple) and wind sites (blue)

A site centered around Jackman's Estate was selected due to the possibility of linking non-domestic anchor loads with high density blocks of flats in Letchworth and the potential for wind generation. While other potential sites in the area could offer better payback periods, these sites tended to have worse wind prospects or include non-domestic buildings only, which goes against the principals of the CHDU project which is aiming to support communities to decarbonise their homes.

3. Network Focus Area

This case study investigates the heat network potential of an area in the south of Letchworth. The area under investigation is fairly well defined by the 16 Output Areas highlighted in the figure below, defined in this report as the *focus area.*

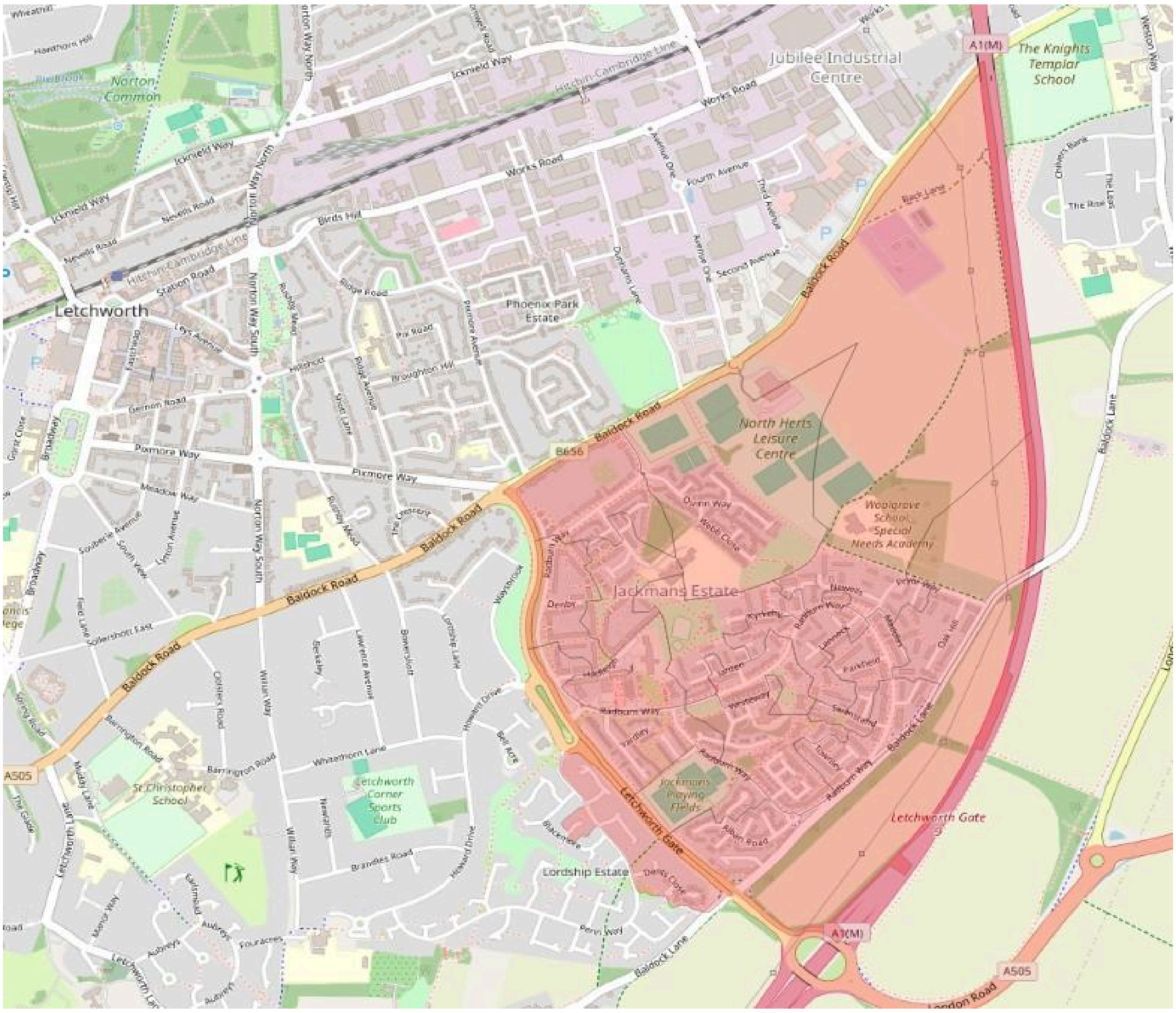

Figure 2: The highlighted Output Areas are well aligned with the heat network focus area

3.1. Letchworth's residents

Letchworth Garden City, commonly known as Letchworth, is a town situated in Hertfordshire. The first garden city built, and surrounded by green belt countryside, the town is a key service hub for the surrounding area, offering a range of amenities, schools and small businesses. The town has a population of approximately 33,000 residents.

Letchworth has a mix of housing stock, including early 20th century brick, post-war brick and prefabricated houses, purpose-built blocks of flats and newer energy-efficient builds.

3.2. Housing Profile & Suitability

An understanding of local housing types is essential in assessing the suitability and design of a heat network. The table below compares the distribution of housing types in the focus area and the national average for England & Wales[11].

Housing Type	Focus area	England & Wales
Detached house	12.0%	23.2%
Semi-detached house	12.2%	31.5%
Terraced house	50.8%	23.2%
Purpose-built block of flats or tenement	24.6%	16.7%
Flats in converted or commercial buildings	0.3%	5.0%
A caravan or other mobile or temporary structure	0.1%	0.4%

Table 1: Housing Types in the focus area vs. England & Wales

The focus area combines areas of medium-density terraced homes and lower-density semi-detached homes with moderate gardens, with pockets of higher-density development in the form of low-rise blocks of flats. These flats concentrate residents within relatively compact areas, creating opportunities for shared heating solutions, while the more spread-out streets of houses present different technical and economic challenges. The housing density per hectare within Letchworth is illustrated below, with the focus area highlighted.

[11] 2021 Census data for England & Wales, Office for National Statistics, https://www.ons.gov.uk/census

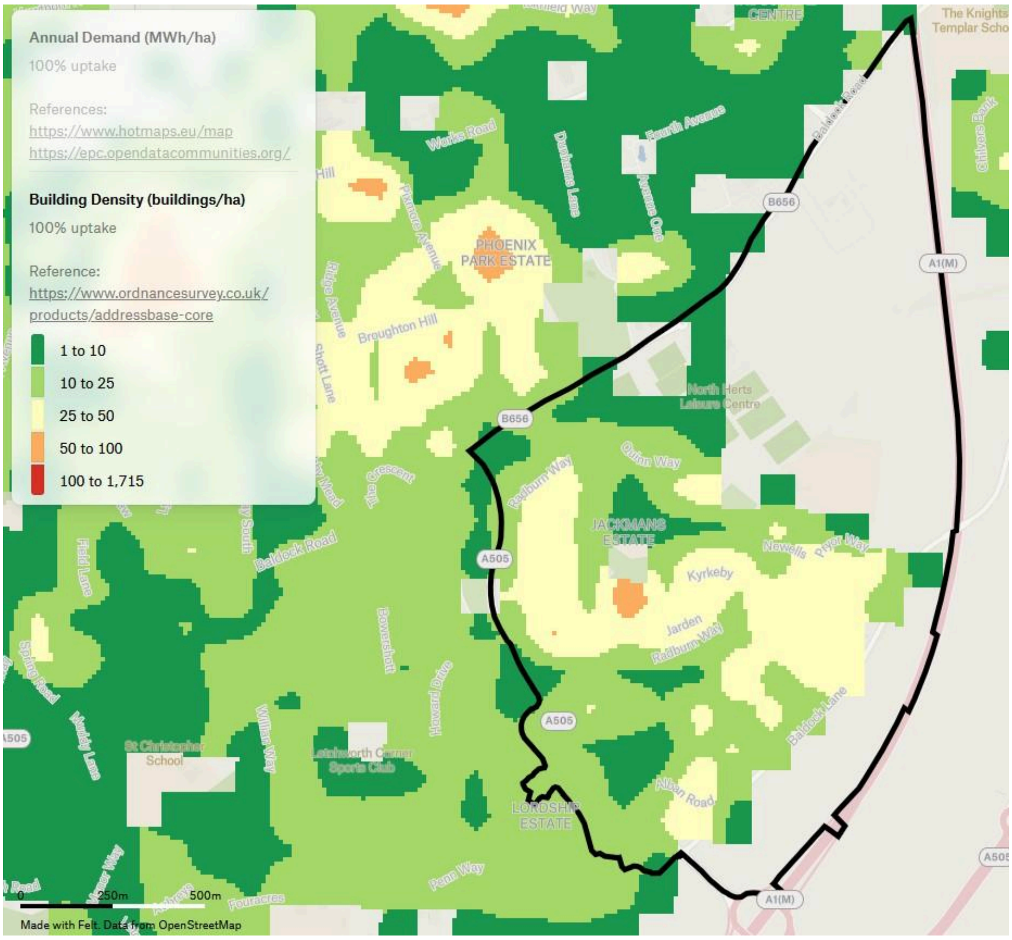

Figure 3: Building density within Letchworth focus area

3.2.1. Key observations

Lower proportion of detached housing

Detached homes account for 12.0% of the housing stock in the focus area, almost half that of the national average of 23.2%. This suggests fewer high-footprint properties and more limited scope for technologies that require external space, such as individual ground or air-source heat pumps.

Low prevalence of semi-detached homes

Semi-detached properties represent 12.2% of all homes in the focus area, considerably lower than the national average (31.5%). While these homes are often suitable for energy retrofit measures and individual ASHP installation, their lower density can pose challenges for the cost-effectiveness of connecting them to a centralised heat network due to the additional pipework required.

Higher share of terraced housing

Terraced houses make up 50.8% of the housing stock, more than double the national figure of 23.2%. Typically 2 storeys high, they are constructed with solid brick under tiled roofs. While these properties do typically have small front gardens and moderate rear gardens that could provide potential locations for individual ASHPs, the relatively narrow plots might constrain placement options and would require careful consideration of noise, airflow, and access for maintenance.

Figure 4: Two storey buildings in the focus area

Figure 5: Example of rear of buildings in the focus area

Figure 6: Density of terraced housing in the focus area based on EPCs

High concentration of flats

Figure 7: Purpose-built flats above commercial buildings in Jackmans Estate, Letchworth

The focus area includes a particularly high proportion of purpose-built flats, with 24.6% of housing in blocks of flats compared to the national average of 16.7%. By contrast, 0.3% of homes are flats located in converted or commercial buildings, far below the national average of 5%, and too small a share to materially affect the suitability of communal heating schemes in the area. While such converted flats can be harder to retrofit due to poor energy performance, fragmented ownership, and complex tenancy arrangements, their minimal presence means the overall feasibility of communal systems is largely shaped by the many purpose-built blocks. This high prevalence of multi-residential dwellings strongly supports the case for shared or communal heating solutions, which are often more cost-effective and technically feasible than property-by-property interventions.

Figure 8: Purpose-built flats in Jackmans Estate, Letchworth

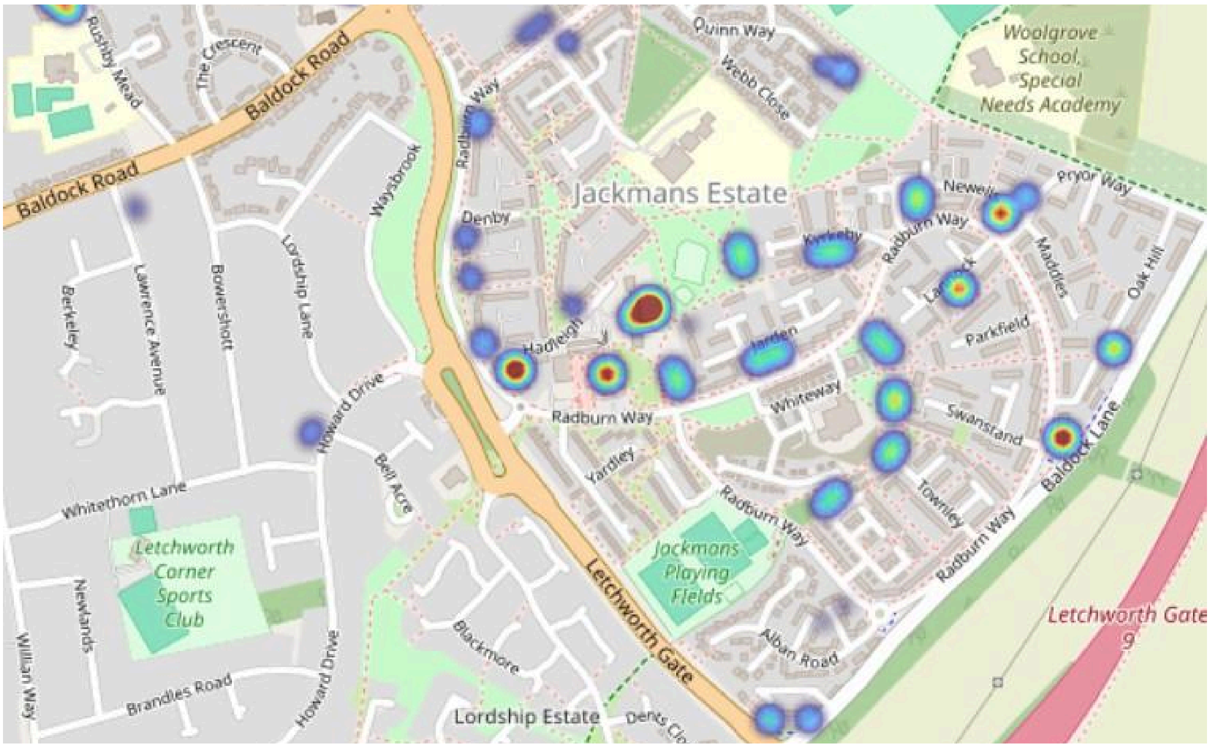

Figure 9: Density of flats in Letchworth's Jackman's Estate based on EPCs (red=more dense)

3.3. House Tenure and Vulnerability

Table 2 presents the proportion of tenure type of buildings across the Letchworth focus area[12].

Tenure Type	Letchworth focus area	England & Wales
Owned	50.9%	61.6%
Shared ownership	0.2%	1.0%
Social rented	40.8%	17.1%
Private rented	8.1%	20.3%

Table 2: Comparison of tenure type in the Letchworth focus area and England & Wales (2021 Census)

High Proportion of Rented Homes

According to the 2021 Census, 48.9% of households in the Letchworth focus area rent their homes, compared with 37.4% nationally. Within this figure:

- 8.1% are privately rented (compared to 20.3% nationally)
- 40.8% are socially rented (compared to 17.1% nationally)

The private rented sector in the focus area is notably smaller than the national average, at just 8.1% compared with 20.3% across England and Wales. Combined with the very low proportion of converted flats, this suggests that the challenges associated with older, fragmented housing stock are less prevalent here. While some privately-rented dwellings may still face retrofit barriers, such as variable energy efficiency and limited landlord incentives to invest, the overall scale of the issue is more contained than in areas with larger private rental markets.

In contrast, the proportion of social housing is substantially higher than the national figure, at 40.8% compared with 17.1% nationally. This strong presence of social landlords can be advantageous for low-carbon heating projects, as housing associations and councils often act as early adopters and can serve as anchor clients for heat networks. Coordinated retrofit programmes across their portfolios can also streamline delivery and reduce costs.

[12] 2021 Census data for England & Wales, Office for National Statistics, https://www.ons.gov.uk/census

Low Proportion of Owned Homes

A lower proportion of homes in the focus area are owned (50.9%) in comparison with England & Wales (61.6%), suggesting that there are fewer financially secure households with the power to opt in to a heat network.

The mix of tenure and housing types in the focus area, particularly the high share of social housing combined with a predominance of purpose-built flats and terraced homes, has a direct impact on the feasibility of low-carbon heating solutions. Denser housing clusters, such as blocks of flats, are well-suited to communal or district heating schemes, while the coordinated ownership of social housing can simplify planning and delivery. Conversely, lower proportions of private rental and converted flats reduce the prevalence of fragmented ownership, meaning fewer barriers to building-wide interventions. Together, these factors suggest that both individual and communal heating strategies could be targeted efficiently, with social housing clusters representing a particularly promising starting point.

3.4. Estimate of Heat Demand

An estimate of the density of annual heat demand across the heat network focus area is presented in Figure 10. The demand density is derived using datasets from the Hotmaps[13] project and Display Energy Certificates[14] using a process described in detail on the CHDU project website[15].

[13] https://www.hotmaps-project.eu
[14] https://epc.opendatacommunities.org
[15] https://communityheat.org.uk/interactive-map/thermal-demand-mapping/

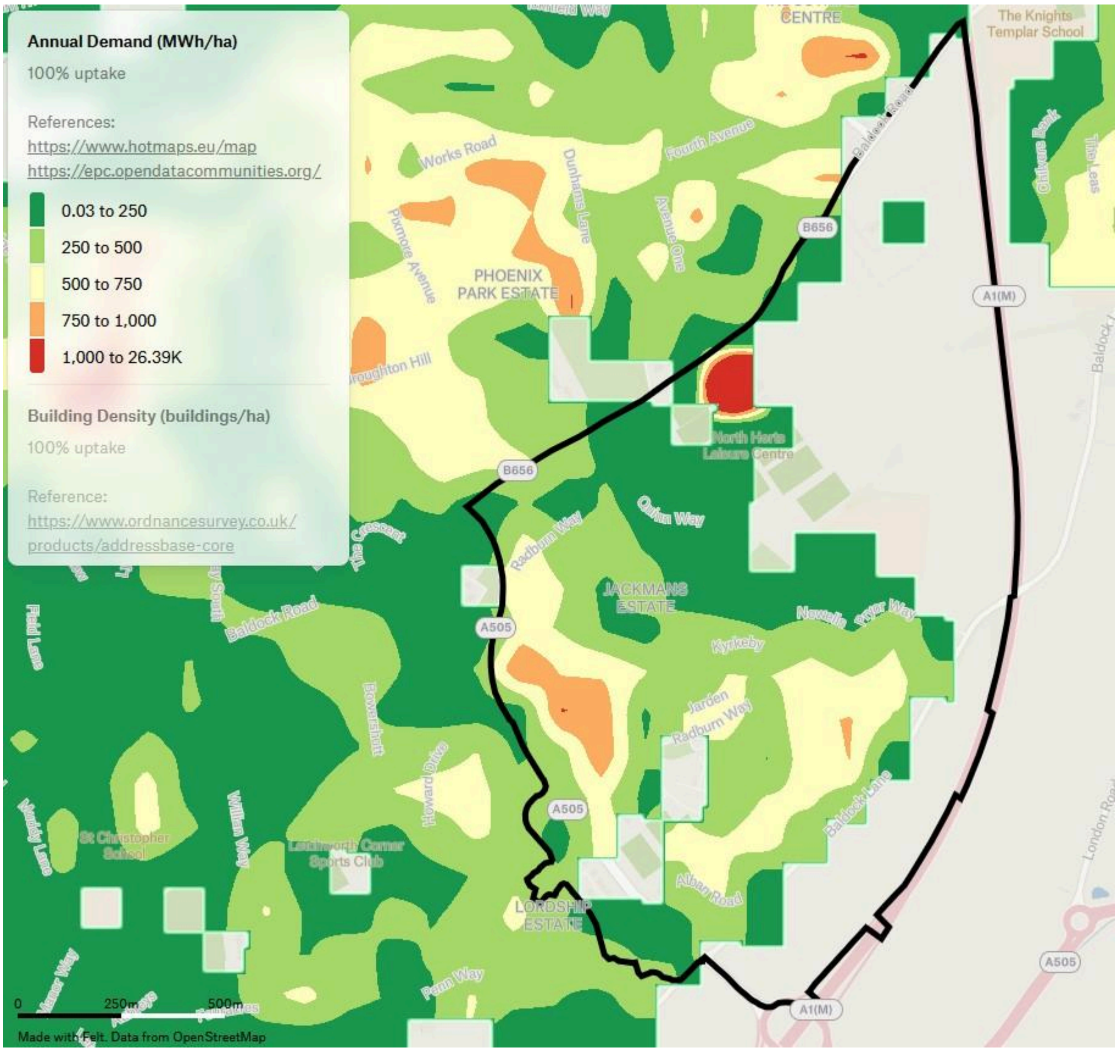

Figure 10: Heat demand density in the Letchworth focus area

The heat demand density used in the initial site searching process suggests a heat network could be centred about the Jackmans Estate area with North Herts Leisure Centre acting as a major anchor load, as identified in red to the north of the map.

4. Community and Stakeholder Engagement

During the course of the CHDU project Sharenergy have discussed the proposed heat network with the following local stakeholders:

- River Ivel Community Energy
- North Herts Council
- Letchworth Heritage Foundation
- Settle Housing Association
- Decarbonise Letchworth

A public event in Letchworth was organised where the CHDU project and proposed heat network was discussed in addition to River Ivel Community Energy presenting their ongoing and planned community energy projects. The event was poorly attended with only 3 attendees from the local area, including representation from North Herts Council and Decarbonise Letchworth. The attendees were generally supportive of the proposed scheme however there is clearly significant work to be done to share the heat network concept with local residents, and establish local support.

The main social housing providers in the area, Settle, are interested in the outcome of this study, although their focus is currently on improving the energy efficiency of their housing stock.

5. Community Benefits

The proposed community heat network in Letchworth offers a wide range of social, economic, and environmental benefits. These are particularly significant for areas experiencing higher rates of fuel poverty, limited heating infrastructure, and economic challenges.

5.1. Affordable, Stable Heating Costs

The network aims to deliver heat at a price comparable to traditional gas heating, which will be significantly cheaper for households currently reliant on electric heating:

- Local census data reveals a lower-than-average density of electric storage heaters in the area.
- Nevertheless, these homes stand to benefit the most from the shift.
- Locally generated renewable electricity used within the network will help shield residents from spikes in national energy prices, offering long-term price stability.

Addressing Local Heating Needs

The table below shows the percentage of households with different heating systems in the proposed location.

Type of central heating in household	Focus area	England & Wales
No central heating	0.4%	1.5%
Mains gas only	83.6%	73.8%
Tank or bottled gas only	0.6%	1.0%
Electric only	5.3%	8.5%
Oil only	0.3%	3.5%
Wood only	0.1%	0.1%
Solid fuel only	0.0%	0.2%
Renewable energy only	0.1%	0.4%
District or communal heat networks only	0.6%	0.9%
Other central heating only	0.6%	0.9%
Two or more types of central heating	8.1%	8.5%
Two or more types of central heating (including renewable energy)	0.4%	0.5%

Table 3: 2021 Census statistics on existing heating systems in the proposed heat network location

Mains gas is the dominant heating source in the focus area; its usage is notably higher than the national average (83.6% vs 73.7%). This is consistent with Jackmans Estate's housing stock.

The area shows a lower reliance on electric systems (over 5.3% in the focus vs 8.5% nationally). Although the cost of connecting buildings without existing wet heating systems to a heat network is higher, they are still prime candidates for alternative, more efficient heating systems.

Figure 11: Density of buildings on electric storage or room heaters (Yellow to blue: lowest density to highest density)

Joining the proposed heat network benefits landlords of electrically heated properties two fold since it will improve the EPC ratings of the buildings whilst providing some of the funding to install the heat interface unit and network connection up front.

5.2. Tackling Fuel Poverty

Fuel poverty is not a significant local issue, with rates in the area at 8.9%[16], slightly lower than the average for England of 11%[17]. However, properties with gas or electric heating are exposed to fluctuations and price spikes in the global energy markets, such as those experienced in 2022 when Russia invaded Ukraine. A community led centralised heat network which uses local wind generation to supply much of the electricity to the heat pumps, insulates customers from price shocks and offers them improved cost certainty.

Well designed wet heating systems should improve the comfort of residents compared to electric storage heaters and reduce their daily heating costs. The heat network connection offer of supplying each customer with a heat interface

[16] DESNZ, Sub-regional fuel poverty, 2023 data,
[17] DESNZ, Fuel poverty detailed tables 2025 (2024 data)

unit and connecting their property to the heat main avoids the upfront cost of a landlord or owner-occupier looking to upgrade their heating system.

5.3. Reliable, Low Carbon Heat

Community heat networks can offer greater reliability than aging individual electric heating systems. The use of renewables and low-carbon infrastructure contributes to lower greenhouse gas emissions and supports the broader goal of balancing carbon production and reduction. Air quality in Letchworth is generally considered good, but a reduction in gas boiler usage may offer additional local benefits.

5.4. Social and Economic Impact

Local job creation may be supported through construction, operations, and maintenance. Community infrastructure projects can provide training and employment pathways. Community ownership and participation in the project fosters local pride, collaboration, and cohesion, helping to strengthen neighbourhood resilience.

While the project contributes to national climate goals, its primary aim is local: to provide affordable, clean, and dependable heating for the residents of Letchworth.

6. The Heat Demands and Opportunity

6.1. Why Install a Heat Network?

'Heat Network' is the term now used for 'district heating' (DH) or 'community heating'. Heat Networks are the interconnection of heat loads such that they can be served from centralised heat sources.

Heat Networks currently provide 2% of UK heat demand and the Committee on Climate Change estimated in 2015 that with Government support, they could provide 18% of heat demand by 2050 in a least-cost pathway to meeting carbon targets.

Heat Network advantages include:

- The load diversification across a Heat Network and the use of thermal storage means the capacity of the central Energy Centre is smaller than the sum of the capacities of plant installed for heating each building.

There is also better utilisation and possible higher operating efficiencies from expensive low-carbon heating plant such as heat pumps.
- Flexibility to change the heat source, and scope to locate plant at an optimum location e.g. a heat pump that takes heat from a river can be located near to that river; a Heat Network initially heated by biomass can be switched to heat pumps at a later date.
- Enables removal of individual boilers in each building.
- Heat network connection equipment in each building requires very little maintenance and no legally required gas safety check, as is required for gas boilers.
- Allows for simpler inclusion of thermal storage. Thermal storage is a tried and tested, low risk technology, and can be up to 100 times cheaper per unit of energy stored than batteries.

Larger/centralised plants offer a number of advantages:
- Can be cheaper to build and operate than boilers/heat pumps in each building.
- The higher operating efficiencies of centralised plant mean low-temperature 4th generation heat networks (~65℃ flow temperature) can be more efficient than individual systems and should be able to make use of existing heating systems within buildings without the need for expensive and disruptive retrofit.
- Maintenance costs usually lower per unit of heat generated.
- Easier to achieve direct supply of cheaper electricity from local renewable generation to heat pump.

Heat Networks are an established technology, although more common in other countries. For example, over 60% of homes in Denmark are heated from a Heat Network, and many of these are community owned. In the UK Heat Networks are less common and tend to be in cities, e.g. in London Battersea Power station used to heat thousands of homes in Westminster before it closed, and all the sports and other buildings on the Olympic Park in east London are on a Heat Network. On a smaller scale the best example is the Heat Network installed in the village of Swaffham Prior[18], east of Cambridge.

[18] Swaffham Prior Heat Network

6.2. Energy Performance Certificates

6.2.1. What is an EPC?

An Energy Performance Certificate (EPC) rates the energy efficiency of a building on a scale from A (most efficient) to G (least efficient). EPCs are legally required when a property is built, sold, or rented. The rating is based on the building's construction and energy systems, such as insulation, heating, and lighting, not on how energy is actually used by its current occupants.

While EPCs are now widely available, it's important to note that not all properties have one, particularly older homes that haven't changed hands or been rented in recent years. Owner-occupied homes, especially those owned long-term by older residents, may be underrepresented in EPC datasets. Homes with EPCs may not represent all homes in an area, but because EPCs are required for sale or rental, they are likely to form a broadly representative sample of the local housing stock.

EPC data can still provide valuable insights into overall housing efficiency and help identify areas that may benefit most from energy improvements, like those targeted by a community heat network.

6.2.2. EPCs in the Proposed Heat Network Location

The table below shows the percentage of households by EPC rating[19]:

EPC energy rating	Letchworth focus area	England & Wales
A-B (Most Efficient)	14.0%	14.4%
C	48.1%	31.0%
D	32.6%	38.6%
E	3.7%	13.0%
F	0.9%	2.3%
G (Least Efficient)	0.6%	0.7%

Table 4: Domestic EPC ratings in Letchworth and England & Wales

[19] 2024 Energy Efficiency in Housing dataset, Office for National Statistics

High Proportion of High-Efficiency Homes

As of 2024, 14.0% of homes in the focus area were rated B or above, comparable to 14.4% nationally.

Majority of Homes Rated C or D

A combined 80.7% of homes are rated C or D, considerably higher than the national average (69.6%). C rated homes are the most common, with 48.1% of homes in this band. While C-D ratings are considered "average" efficiency, C is now the target minimum rating for future energy efficiency policy for landlords, from 2030. Figure 12 shows the spread of C- and D-rated domestic properties the focus area:

Figure 12: Location of domestic properties in the focus area with EPC rating of C or D

Low Proportion of Low-Efficiency Homes

An E rating is currently the minimum required EPC rating for private rental properties, with F and G rated homes considered to be very inefficient. Only 5.2% of homes in the focus area are rated E, F or G compared with 16.0% nationally.

6.3. Existing Heating Systems

There are pros and cons to connecting any existing heating system to a new heat network. As reported in Table 5 the majority of houses in the case study area have gas central heating (83.6%) or electric heating (5.3%).

6.3.1. Gas central heating

A gas central heating system typically consists of a gas boiler and radiators. Gas central heating already has a wet system (radiators and pipes) in place, and, since the proposed heat network will operate at a similar flow temperature to a gas boiler, they can often be reused. These systems are common in the UK, so retrofit experience is well developed and the systems will be familiar to installers, meaning that it will generally be relatively straightforward to swap the existing gas boiler with a heat interface unit (HIU).

The challenges of connecting an existing gas central heating system to a centralised heat network are that gas disconnection and boiler removal will be required.

6.3.2. Direct Electric Heating

Direct electric heating systems include storage heaters, panel heaters or fan heaters. They are often installed in flats or hard-to-retrofit homes where the installer wants to avoid fitting pipes and are more common in fuel-poor or hard-to-heat homes. As they do not have existing pipework or radiators, full installation of a wet system will be required, which may be costly and disruptive due to the potential need to open up walls and floors.

6.4. Heat Anchor Loads

6.4.1. What is an Anchor Load?

Anchor loads are buildings with a large, consistent heat demand, giving a predictable baseline heat consumption. Heat networks are most efficient when operating steadily, and a consistent anchor load helps to ensure that heat pumps run at optimal levels. Anchor loads can also provide financial stability, making the business case stronger and providing revenue to cover fixed costs or cheaper tariffs for smaller customers. Anchor customers are often public-sector organisations (e.g. schools, NHS) with long-term energy contracts, reducing the risk of demand loss. Heat networks can be built around the anchor load and then expanded over time to connect more homes or businesses, which may be lower risk and more manageable than connecting everything at once.

The scheme had originally intended to supply heat to North Herts Leisure Centre, a significant anchor load which consumed over 3.5 GWh of gas in its combined heat and power (CHP) facility in 2024-2025 according to its most recent Display Energy Certificate (DEC). However during the course of this project North Herts council were awarded funding[20] from the Public Sector Decarbonisation Scheme (PSDS) to improve the energy efficiency of the facility and change their heating system from gas CHP to ASHPs. Other non-domestic buildings in the estate which could act as anchor loads include Garden City Academy and the Woolgrove School.

Note that there are also 49 flats heated by existing communal heat systems split across two buildings which could be easily connected to the proposed heat network.

7. Technology

7.1. Air Source Heat Pumps

7.1.1. What are Air Source Heat Pumps?

The CHDU heat network model uses large multi-stage air source heat pumps (ASHPs) to provide most of the heat to the network. These heat pumps use electrically powered pumps to move heat from the air into the heat network.

The efficiency of heat pumps at a single point in time is referred to as their coefficient of performance (COP) which is the ratio of the heat energy emitted to the electrical energy consumed. The instantaneous COP of an ASHP varies due to operating conditions such as the temperature of the air entering the unit, typically the outdoor ambient air temperature, and the temperatures of the incoming and outgoing coolant. The seasonal COP (SCOP) of the heat pump is calculated by dividing total heat energy generated within a calendar year by the total electrical energy consumed.

[20] https://www.north-herts.gov.uk/leisure-centre-decarbonisation-project

Figure 13: Vestervig Fjernvarme[21] 1.2MW ASHP (highlighted) and biomass energy centre

ASHPs connected to a low temperature centralised district heat network at Letchworth, producing heat at an average annual temperature of approximately 65℃, are expected to operate at a SCOP of 3.1. Providing heat to a network at this temperature means that individual buildings shouldn't need to upgrade the pipework and radiators connected to their existing gas central heating systems.

7.1.2. Why Choose Air Source Heat Pumps?

ASHPs have been selected for these case studies instead of other heat sources since they are more affordable than other heat pumps such as ground or water source systems and less reliant on specific local conditions, meaning they can be installed with fewer restrictions and disruptions. Other technologies could be explored when specific areas are given further consideration.

7.2. Thermal Storage

Within a district heat network, thermal energy storage takes the form of a hot water tank used to store generated heat for use when it is needed. An example of a thermal storage tank used in a district heat network is visible in Figure 14.

[21] https://segenergy.dk/en/vestervig-fjernvarme

Figure 14: Example of a thermal store

7.2.1. Why use thermal energy storage?

Heat pumps don't always produce heat at exactly the moment people need it. Thermal stores allow the system to generate heat when it's most efficient to do so (e.g. during off-peak electricity hours or when the wind turbine is generating), and use it later when demand peaks. If the heat pump can't temporarily meet demand (e.g. in very cold weather), the system can draw on stored heat. This reduces how often the network needs to use a backup boiler, which is more expensive and higher in carbon emissions. Thermal storage also means that any heat generated that is not used immediately can be captured and used later, avoiding waste and improving overall system efficiency.

7.3. Back Up Plant

7.3.1. Why are backup boilers needed?

ASHPs rely on electricity and external ambient temperature to generate heat efficiently, however they are vulnerable to performance degradation in very low temperatures, grid outages and technical faults. As a heat network needs to be able to supply heat reliably, it is important to have a contingency system in place that can maintain internal temperatures and avoid disruption in heating services if the ASHP becomes inoperable.

The backup boilers can also top up the heat generated by the ASHPs to meet peak demand during the colder months. Using backup boilers in this way is financially beneficial to the network since the much more expensive ASHP could be reduced in size, compared to if it was required to meet 100% of the peak heat demand. For example, sizing the ASHP to meet 90% of the total annual heat demand means that it can have approximately 50% of the capacity compared to if it were sized to meet the peak heat demand. This is illustrated in Figure 15.

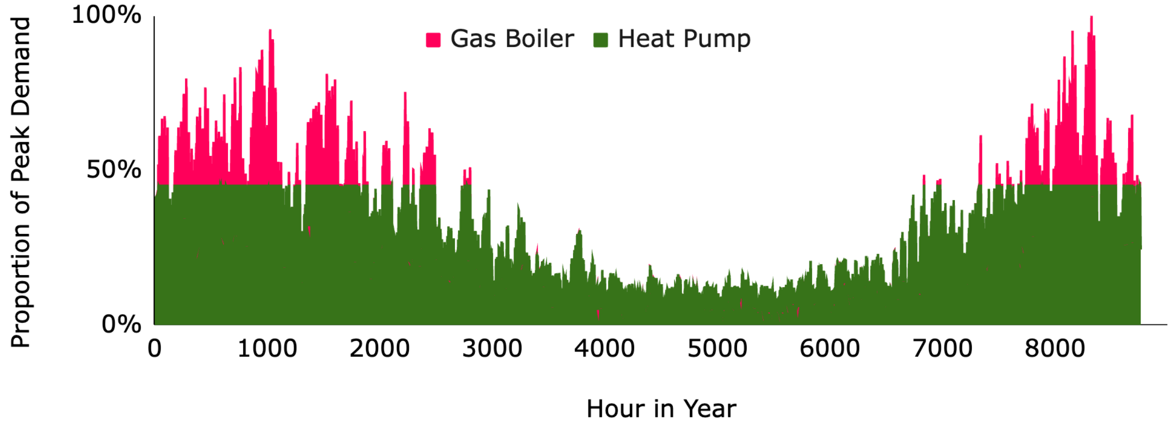

Figure 15: Split of heat supply throughout a year, 10% of heat from gas

7.3.2. Technology

Letchworth is connected to the national gas network so a gas boiler would be most suitable to provide backup heat. Gas boilers connected to the mains gas network typically have several advantages over an oil boiler, providing quicker start-up times, lower maintenance requirements and no storage requirements. Gas boilers also have lower CO_2 emissions and fewer particulates, making them a cleaner choice for low-carbon strategies.

In the future, these gas boilers could be replaced by electric boilers to further decarbonise the heat network, but this would require a reduction in the price differential between gas and electricity (the “spark gap”) to maintain the financial viability of the network.

7.4. Renewable Electricity Source

7.4.1. Key Benefits of 'Onsite' Renewable Generation

The financial viability of a heat network which uses ASHPs to supply much of the heat is directly related to the price of electricity used to power the heat pump and other core infrastructure including water pumps and circulation systems, and control and monitoring systems.

Generating electricity from renewable sources is typically cheaper than importing electricity from the grid, particularly as energy prices rise, and ensures a more stable cost of heat generation since it is decoupled from global fossil fuel prices. This also opens up the potential for secondary income streams since surplus electricity could be sold to a local offtaker through a private wire agreement, offering a more favourable price than their existing supplier, or exported to the national grid though typically at a much lower price.

Using onsite renewable generation to power the network energy centre reduces carbon emissions compared to importing electricity from the grid, and the export of electricity potentially pushes gas generation off the grid, reducing the carbon intensity of grid electricity.

7.4.2. Available Options

Wind power

Wind has the advantage that its generation profile is better aligned with heat demand compared to solar: wind speeds (and therefore output) are typically higher in autumn and winter, which corresponds to peak heating needs:

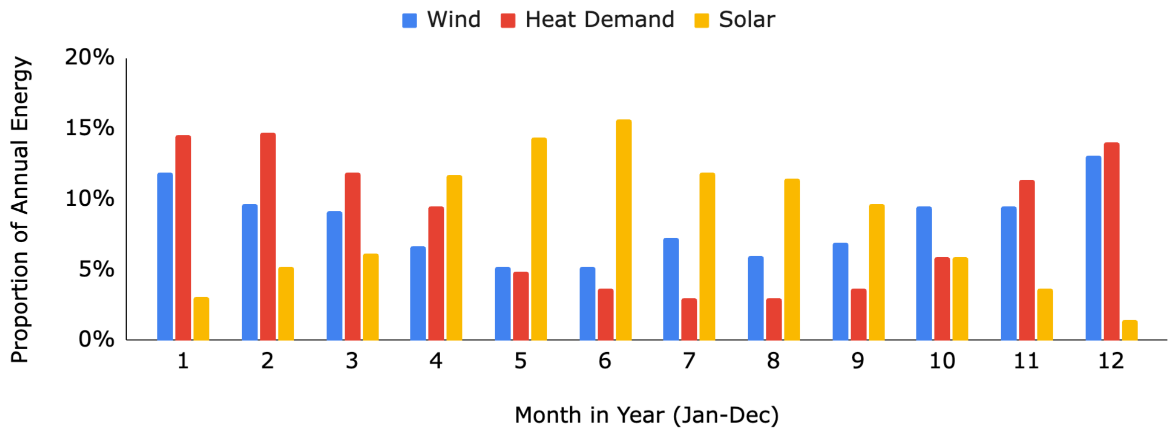

Figure 16: Monthly Wind and Solar Generation vs Heat Demand

A 3 MW wind turbine can produce approximately 3x more electricity than an equivalent capacity in solar PV over the course of a year; higher generation means more energy to use onsite or sell to others, improving the economic case. However planning permission for onshore wind remains difficult to obtain in many areas, and careful consideration needs to be given to landscape and noise considerations - site-specific wind resource assessment is essential for viability.

Solar PV

Solar PV generally has lower capital costs than wind, and has historically been much easier to gain planning permission, however solar generation is highest in summer and during daylight hours, when heating demand is lowest, creating a mismatch with energy use. Site selection work indicates that, where feasible, wind power is strongly preferable due to better seasonal alignment with the heat network's electricity needs.

7.5. Network Pipework and Building Connections

Pipework forms the physical backbone of a heat network. It is used to transport heated water from the energy centre to individual buildings and for returning cooler water back to the energy centre.

Pipes are typically pre-insulated steel or plastic, designed to minimise heat loss through effective insulation, withstand high temperatures and pressures, and resist corrosion and external damage. Steel pipes are often used for high-temperature, high-pressure main distribution pipes, while plastic options may be suitable for lower-temperature branches. Typical diameters vary from small branch pipes (~25–50 mm) to large distribution mains (up to 400 mm or more), depending on the heat load and the number of buildings being served.

7.5.1. Installation Considerations

The installation cost of pipework is normally the largest capital expense in a heat network project. The most significant factor is not the pipe itself but the cost of digging and laying the trench. Often referred to as the "civil works" portion of the project, trenching costs include excavation, pipe laying, backfilling, and reinstatement.

The term 'soft dig' refers to trenching through open ground such as fields, parks, or gardens, and 'hard dig' to refer to trenching under roads, pavements, and other built-up areas. Hard dig is significantly more expensive than soft dig, highly disruptive to traffic and local access, and may require road closures, traffic management and longer working times. Proper planning and route optimisation can help reduce costs by favouring soft dig areas where feasible.

7.5.2. Connection to Existing Buildings

To connect each property to the heat network, new pipework will need to be installed between the main network pipe running along the road and the property's internal heating system. Where properties have a front garden, these pipes will need to be buried underground as they pass through it. A suitable entry point to the house will then be identified. For properties with a basement, installation is typically more straightforward: the pipes can enter at the most convenient location and run through the basement to the area nearest the current boiler.

The actual connection between the heat network and the property is via a Heat Interface Unit (HIU), also known as a Hydraulic Interface Unit. This unit would typically be installed where the property's existing boiler is located (replacing the boiler), as this area usually has the necessary space and provides the simplest access to the existing heating and hot water systems.

However, if the current boiler is situated outside or in an unheated space (such as a shed), the HIU would be relocated inside the property to avoid any risk of freezing. Unlike a traditional boiler, an HIU does not require ventilation or a flue, produces no noise or odour, and is generally more suitable for indoor installation. This flexibility allows for a wider range of potential locations within the home. Ideally, the HIU would be installed in a basement, as this provides easy access to the heat network pipes running beneath the road or pavement.

The HIU itself is wall-mounted and roughly the same size as a gas combination boiler. It requires a mains electricity supply to power the circulation pump and internal controls. HIUs are typically encased in a white metal or durable grey polystyrene cover.

Figure 17: HIU located in a property

Each HIU includes a heat meter that measures the amount of heat drawn from the network. This meter is read automatically, with the data also used to help identify any faults within the HIU or the wider system.

Heating system compatibility and installation

The heat network is designed to work with a standard "wet" heating system, where hot water is circulated through radiators or underfloor heating to provide space heating. In properties that already have a wet system in place, it may be possible to retain and connect it to the new HIU, provided it is in good condition and compatible with the heat network's lower flow temperatures. The HIU contains a plate heat exchanger, which ensures the radiators can continue to operate at their existing pressure. A report by Marches Energy Agency[22] has

[22] https://mea.org.uk/

shown that for a heat network flow temperature of 65-70℃, no building upgrades should be necessary.

For properties that currently rely on a “dry” heating system, such as electric panel heaters or storage heaters, a new wet system would need to be installed. This involves fitting radiators or underfloor heating, as well as the associated pipework. Although this represents a more significant installation effort, it enables the property to benefit from more efficient and controllable heating through the heat network, often with lower ongoing energy costs compared to electric heating.

8. Proposed Heat Network

8.1. Network Layout

A district heat network is designed to efficiently distribute low-carbon heat from the centralised heat source (in this case an ASHP and backup boiler) to connected buildings across the site. The proposed layout reflects both engineering best practices and site-specific constraints to optimise performance and minimise costs.

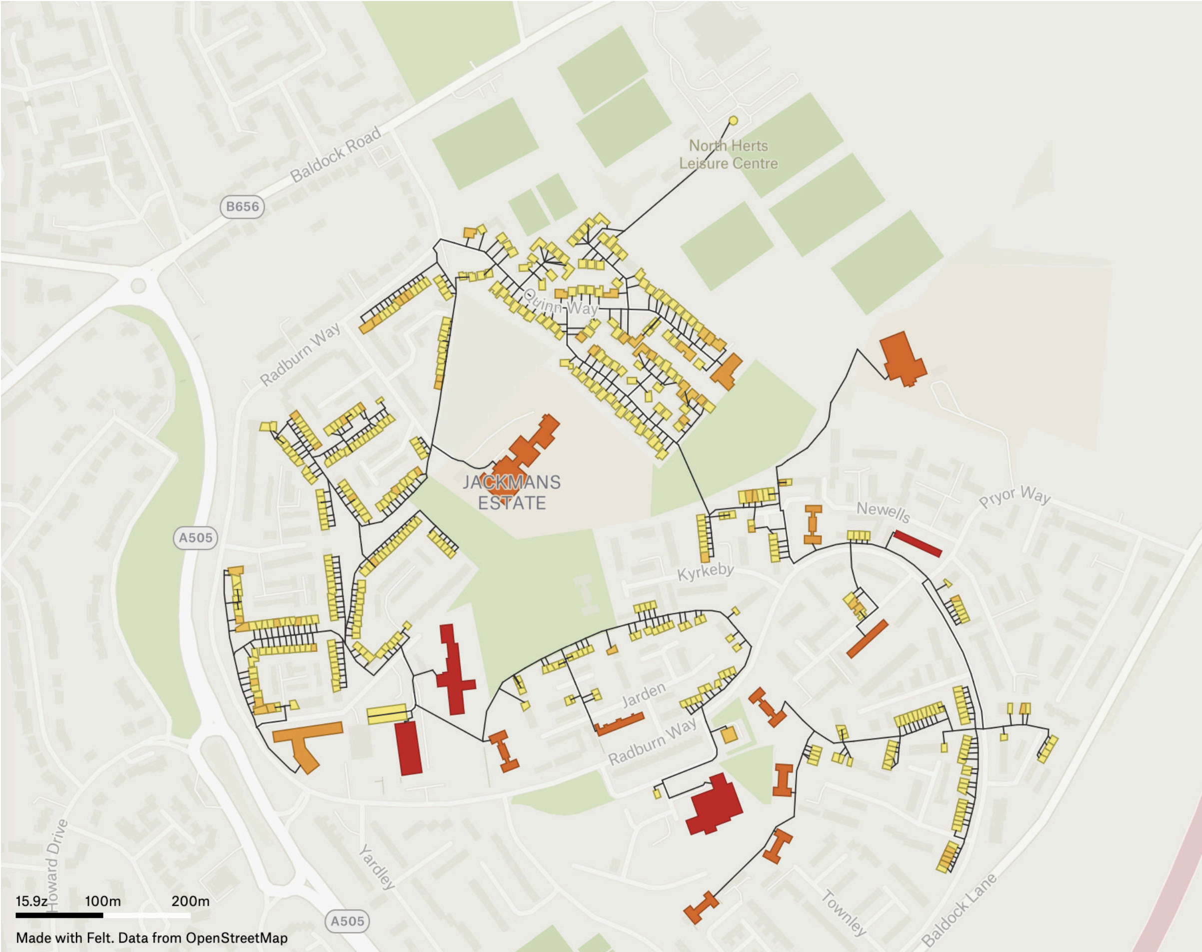

Figure 18: Proposed network layout

The heat network is projected to connect to **827** residential and/or commercial properties over the lifetime of the project. Initial uptake is expected to include the Garden City Academy and Woolgrove School and 825 residential properties. The network length is estimated to be 10.36km.

8.2. Heat Demands

The total annual heat demand of buildings connected to the network is presented in Table 7 alongside the heat demands associated with the 2 non-domestic buildings in the proposed network.

Domestic Properties	
Domestic Properties	8,510 MWh
Non-Domestic Properties	
Garden City Academy	247 MWh
Woolgrove School	166 MWh
Sub-total	*413 MWh*
Heat network losses	2,170 MWh
Total	**11,090 MWh**

Table 7: Annual Heat Demand of Buildings in Network

The average annual heat demand of domestic properties connected to the network is 10,320 kWh.

The annual heat demand of non-domestic properties have been estimated from a combination of Display Energy Certificates. The annual heat demand of domestic properties has been derived using EPC data, using estimates from THERMOS where EPC data is unavailable.

8.3. Energy Centre

8.3.1. Proposed Site

A suitable location for the energy centre containing the ASHP might be in the grounds of North Herts Leisure Centre, on the edge of the proposed network. As well as being likely to have sufficient space to site the energy centre (an important consideration in an urban area where space may be limited), the leisure centre is likely to be one of the highest consumers of electricity within the area of the proposed network and may have the opportunity to become an offtaker of any surplus wind-generated electricity, providing both a discount to the leisure centre and income to the heat network.

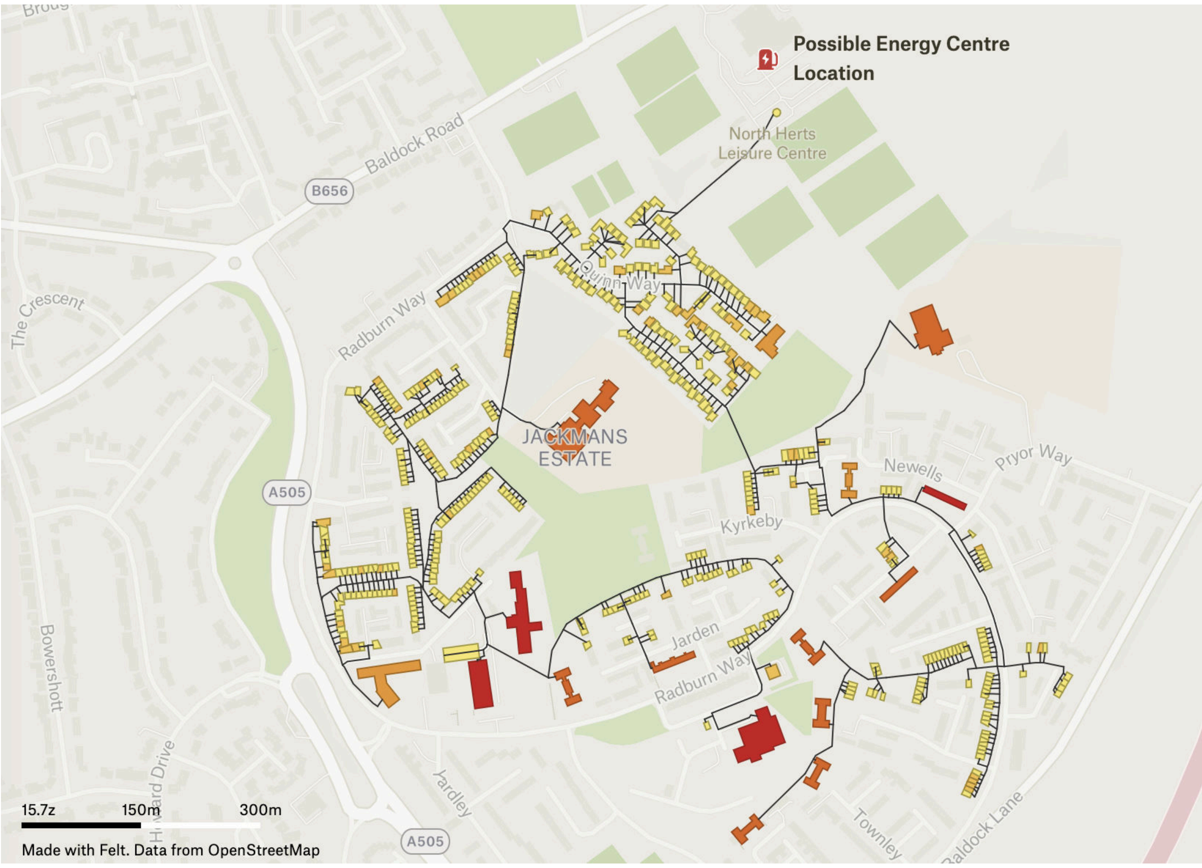

Figure 19: Proposed location of Energy Centre at North Herts Leisure Centre

8.3.2. ASHP, Thermal Storage & Gas Back-up Boilers

A sensitivity analysis has been conducted using EnergyPro[23] to assess the most optimal combination of ASHP size and thermal storage volume while achieving carbon savings which exceed the requirements of the Green Heat Network Fund.

Analysis by Carbon Alternatives has suggested that installation of a 1,690kWth ASHP coupled with a 400m^3 thermal store would provide a good balance of maximising carbon savings while also ensuring the network is economical. This ASHP is sized to provide ~90% of the total annual heat demand of the heat network customers, with the remaining ~10% of heat demand provided by backup gas boilers.

The gas backup boilers would need to be placed in proximity to the ASHP hydraulic interface for efficient system integration, and would require flue installation and connection to the mains gas network. The gas boilers could be replaced with electric boilers in the future to further decarbonise the network.

[23] https://www.emd-international.com/software/energypro

8.4. Renewable Generation

A wind turbine with a peak power output of 3MW is under consideration. Ideally this would be sited close to the heat network energy centre to minimise the length of the power cable to the heat pumps and grid connection. The potential sites which could accommodate a wind turbine with a tip height of up to 150m are presented in Figure 20.

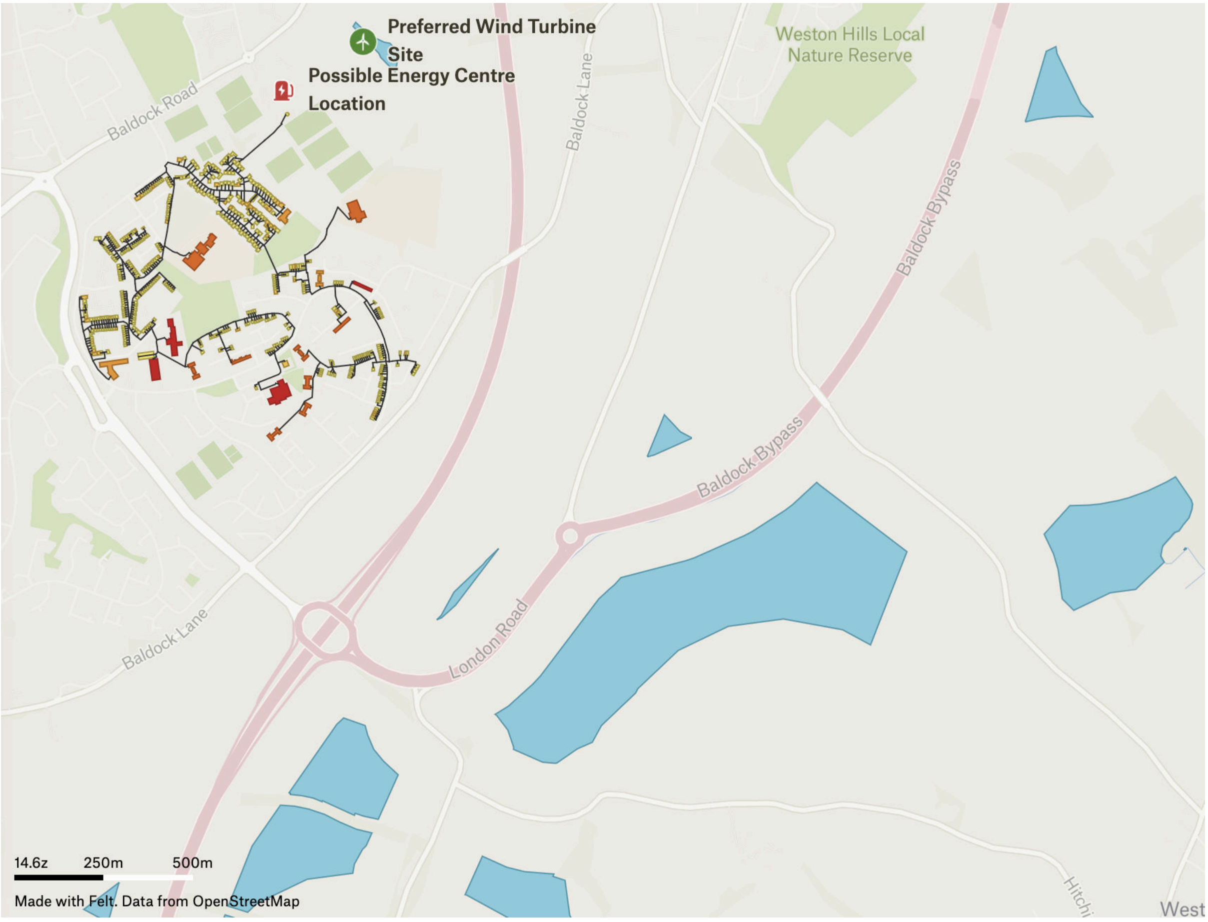

Figure 20: potential wind turbine locations (highlighted blue)

The site to the North East of the estate is identified as the preferred option due to its proximity to the proposed Energy Centre location, where the ASHP would be installed, and North Herts Leisure Centre. Potential sites further south of the estate have also been identified although they will be more expensive to develop due to the longer cable run and crossing of the A1(M). Land owners at these potential sites have not yet been consulted about leasing their land for a wind installation but this is an important next step if the proposed heat and wind project were to proceed.

8.5. Grid Connection

UK Power Networks (UKPN) hosted a grid connection surgery call to discuss the feasibility of connecting a 3MW wind turbine and 1.69MWth ASHP to the local distribution network. The aim is to connect both the generator and ASHP to the distribution network using the grid connection point at North Herts Leisure Centre. This enables the wind turbine to provide much of the power to the ASHPs via a direct wire, and the potential to supply electricity to the leisure centre behind the meter.

UKPN have advised that this configuration would require the current low voltage grid connection used by North Herts Leisure Centre to be upgraded to 11kV. UKPN indicated that there was not a significant capacity limitation at Jackmans East Primary Substation nor a lengthy connection queue preventing the wind turbine from connecting. However, the substation is in an Active Network Management area which may result in the wind turbine generation being curtailed during peak times.

UKPN have also advised that they would need to produce a connection feasibility report following a G99 application before being able to estimate the expected level of curtailment.

A cost of £650k has been allowed for in the financial calculations presented in this report which covers installation of the cabling and upgrading the grid connection at North Herts Leisure Centre. This cost would need to be reviewed alongside the outcome of the G99 grid connection application if this project were to progress to detailed feasibility.

8.6. Electricity Offtaker

As mentioned previously, locating the heat network energy centre at the North Herts Leisure Centre and sharing the facility's grid connection could be mutually beneficial since the leisure centre could purchase electricity at a discounted rate compared to importing electricity from the grid, and the heat network scheme could receive more income compared to exporting electricity. It is predicted that approximately 90% of the leisure centre's annual electrical demand, estimated at 833 MWh following completion of their PSDS funded ASHP installation, could be met by the wind turbine.

8.7. Summary of Electricity Usage

Annual Energy Usage Summary (MWh)	
Wind Turbine Generation	7,860
Wind Generation Consumed by Offtaker	808
Wind Generation Consumed by Network	2,914
% Generation Consumed Locally	47%
% of Network Heat from Wind Generation	73%
Wind Generation Exported to Grid	4,139
Electricity Imported	308
Gas Consumed	1,394

Table 8: Annual energy usage

9. Financial Performance of Heat Network

9.1. Assumptions Made

9.1.1. Tariffs

The electricity tariffs detailed in Table 9 have been used in the financial modelling of the proposed Letchworth heat network.

Tariffs	
Heat Sales Unit Price	7.4p/kWh[24]
Heat Sales Standing Charge	£300/annum
Gas Purchase	6.24p/kWh
Wind Generation Export PPA	9.5p/kWh
Wind Generation Private Wire Sales	20p/kWh

[24] To match domestic customers' current gas heating cost. Based on a gas price of 6.24p/kWh and gas boiler efficiency of 84%.

Tariffs	
Grid Import for use in ASHP	23p/kWh

Table 9: Energy Tariffs used in Techno-Economic Modelling

9.1.2. Green Heat Network Fund Grant

The Green Heat Network Fund (GHNF) is a capital grant programme that initially opened to applicants in 2022 with additional funding available until 2027/28. A successor to the Heat Networks Investment Project, it is a core element of the Government's support for low and zero carbon (LZC) heating and cooling networks. The GHNF provides support for eligible commercialisation and construction costs. Prospective projects are assessed for funding using a range of criteria[25]:

- A carbon gate of 100gCO2e/kWh thermal energy delivered to consumers
- Domestic and micro-businesses must be offered a price of heat lower than a low carbon counterfactual for new buildings and a gas/oil counterfactual for existing buildings
- Demonstration of a Social IRR of 3.5% over 40 years
- Urban networks need a minimum end customer demand of 2GWh/year, rural off-gas-grid networks need a minimum of 100 dwelling
- Maximum grant requested up to but not including 50% of the combined total commercialisation + construction costs (with an upper limit of £1million for commercialisation)
- The total 15-year kWh of heat/cooling forecast to be delivered will not exceed 4.5 pence of grant per kWh delivered (at time of writing)
- Where projects include wider energy infrastructure in their application, income generated/costs saved/wider subsidy obtained should be greater than or equal to the included costs

Of those criteria, the nominal upper benchmark of 4.5p/kWh is the main limiting factor, with this figure functioning more as a ceiling than as a target. The competitive nature of the fund means that only the most economically efficient projects are likely to exceed. As a result, the GHNF has only been funding schemes asking for 2.5p/kWh or less, which effectively halves the amount of grant available. Schemes which can target this level of grant funding are often

[25] Green Heat Network Fund (GHNF): Scheme Overview, 2022

focussed on non-domestic buildings and are able to charge significant fees to non-domestic buildings wishing to connect to the network or access other funding pots such as the Public Sector Decarbonisation Scheme (PSDS). As described earlier in this report, future updates to the Warm Homes fund may help bridge the funding gap for ~50% of homes in the network, however charging a connection fee is not an option for most of the domestic connections included in the proposed scheme in Letchworth. The analysis reported here assumes that the full 4.5p/kWh is available either through the revised GHNF or some other sources.

9.1.3. Equity and Debt

Development Loan

During the construction and early development stage, the project may require short-term working capital through a development load, with an assumed interest rate of **8.0**%. This loan covers pre-revenue expenditure and would typically be repaid or refinanced upon completion.

Long-Term Loan

Following commissioning, a large portion of the capital costs will be refinanced through a long-term loan. Loan rates aligned with the National Wealth Fund[26] have been assumed, which at the time of writing are set at gilt pricing +40bps. This assumes that the Local Authority will be at least partially involved in developing and owning the scheme. The loan for purchasing and installing the pipework is modelled as having a term of **50 years** and an interest rate of **5.35%**.

The loan for purchasing and installing the network energy centre, household connections and renewable generation is modelled as having a term of **25 years** and an interest rate of **5.95%**. Both loans are modelled as annuities. This debt is structured to be repaid from operational income (heat and electricity sales) and sized to ensure sufficient headroom for contingencies and maintenance reserves.

Community Shares

A further share of capital may be raised through community shares, allowing local residents and supporters to invest directly in the project. While shares have not been included in our techno-economic model, it's likely that a proportion of the capital would be financed through community share raising, with an interest

[26] https://www.nationalwealthfund.org.uk/local-authority-services/our-lending-offer

rate of 4% to 5% in line with typical expectations for community energy investments. Community shares are non-transferable and interest is not guaranteed, but still represent a key engagement and financing tool.

9.1.4. Inflation

Inflation has been modelled using the CPIH value of **2.5%** annually for the escalation of operational costs, replacement capital costs and heat pricing.

9.1.5. Project Lifespan

The financial model assumes a total project lifetime of **50** years, which aligns with the expected minimum operational lifespan of the heat network pipework. For simplicity, major plant replacements (e.g. ASHPs and the wind turbine) are modelled as occurring after 25 years.

9.2. Capital Costs

Capital costs include the costs of the materials and components needed in the development of the heat network, and the costs of installing them. Reasonable estimates of capital costs are reported here using publicly available sources and previous project experience, however more detailed feasibility work would need to be completed in order to gain quotes from potential suppliers. Further details of how the capital costs have been derived are available on the CHDU project website[27]. The capital costs for the proposed heat network in the Letchworth focus area are presented below.

9.2.1. Domestic Connection CAPEX

The cost of the purchasing a HIU and performing the internal works to connecting a domestic house or low-rise flat to a district heating network has been estimated by Buro Happold[28] as being approximately £9,000, when inflated to 2025 prices. This excludes the cost of installing the pipework between the network main (usually in the road) to the property boundary, which is accounted for in the reported pipework costs.

The properties at Jackmans Estate were mostly constructed in the 1960s and 1970s and are not subject to heritage constraints. There may be solutions specific to the housing archetypes at Jackmans Estate to reduce this cost. For

[27] https://communityheat.org.uk/techno-economic-model/network-capex-costs/

[28] https://www.usdn.org/uploads/cms/documents/161214_-_connecting_existing_buildings_to_dhns_-_technical_report_00.pdf

example, the terraced housing, of which there is a high proportion, could potentially connect to the network via pipework which runs through the loft space of adjoining properties, reducing the amount of pipework which must be installed in the highway. Additionally, network pipework could potentially be run up the outside of the blocks of flats and enter individual properties where the existing gas boiler flues are installed.

Due to the high proportion of properties in Jackmans Estate which are owned by a Social Housing Landlord, 42%, and privately owned or rented properties housing low income families, estimated as being 10%, it is anticipated that grant funding can be accessed to reduce to the average cost of connecting domestic properties to the network. The tranches of the Warm Homes funding schemes which may be relevant are detailed in table 10.

Description	**Proportion**	**Grant Name**	**Max Grant Amount for Heat Network Connection**
Social housing	42%	Warm Homes: Social Housing Fund (Future Wave)	£7,500[29]
Non-social housing, EPC <C, low income	10% (estimated)	Warm Homes: Local Grant	£15,000[30]
Non-social housing, other incomes	48%	Boiler Upgrade Scheme	£0

Table 10: Details of CAPEX costs (£k)

Warm Homes: Social Housing Fund

It is understood that the primary social housing provider in Jackmans Estate, Settle[31], are currently focused on using funding from Wave 3 of the Warm Homes: Social Housing Fund[32] to install insulation and home improvement measures to reduce the energy consumption, and hence heat demand, of properties with low EPC ratings aiming to bring properties up to a minimum

[29] Pending definition of heat network quality standards.
[30] Pending definition of heat network quality standards.
[31] https://www.settlegroup.org.uk
[32] https://assets.publishing.service.gov.uk/media/68529d0bff16d05c5e6aa680/warm-homes-social-housing-fund-wave-3-guidance.pdf

rating of C. Wave 3 of the scheme is now closed however it is expected that a fourth wave of funding will become available post 2028[33] through which Settle may be able to access £7,500 of grant funding per property to fund connection to the proposed low carbon heat network, assuming existing plans to fund heat network connections through the scheme are pursued.

Note that the improvement in energy efficiency of the properties managed by Settle may negatively affect the financial performance of the heat network by reducing the income from heat sales to these properties but will potentially open up capacity for more buildings in the estate to connect to the network.

Warm Homes: Local Grant

North Hertfordshire have been awarded £1.5m from the Warm Homes: Local Grant scheme[34]. The scheme offers funding to properties with an EPC rating of D or below to improve their energy efficiency and install a low carbon heating system, providing the household meets various criteria mostly based on income.

Approximately 40% of properties in Jackmans Estate have an EPC rating of D or below and at least 1/3 of Jackman's Estate is within an area identified as having an Indices of Multiple Deprivation (IMD) Income Decile (ID) of 2 meaning these homes would automatically meet the criteria for accessing up to £15,000 for low carbon heating measures. Households in other areas of Jackman's Estate which have IMD:ID ratings of 3 and 4 may also be eligible based on individual household incomes.

While the scheme will not currently subsidise the cost of connecting to a low carbon heat network, the scheme guidance documentation suggests that connections may soon be eligible stating that: "*The department is therefore working at pace to ensure that connections to low-carbon communal heating and district heat networks are covered by appropriate quality standards, with a view to then incorporating them into the Warm Homes: Local Grant.*".

Based on the proportion of privately owned or rented properties in the Jackmans Estate with EPCs of D or below, and proportion of households with an IMD:ID

[33] https://www.uswitch.com/gas-electricity/guides/warm-homes-social-housing-fund/

[34] https://www.gov.uk/government/publications/warm-homes-local-grant-successful-local-authorities/warm-homes-local-grant-successful-local-authorities#north-hertfordshire

rating of 2, it is estimated that 10% of properties could have their heat network connection cost fully funded by the grant.

Boiler Upgrade Scheme

The Boiler Upgrade Scheme (BUS) cannot currently be used to fund the connection of properties to a low-carbon heat network.

Summary

Assuming the costs of connecting housing owned by Social Housing Landlords and low income households residing in properties with EPC ratings of D or below can have much of their connection costs grant funded, the average cost of connecting properties to the proposed network is estimated at **£4,881 per property**.

9.2.2. Trenching and Pipework Purchase and Installation

While a lot of the properties in Jackmans Estate are terraced housing or blocks of flats, the layout of the estate means that there is a large amount of undeveloped space between clusters of housing. For example, the terraced houses located along the streets Denby Elice and Goldon have green space and footways running along the backs of the gardens. Using these routes to install the network pipework (referred to as soft dig) is significantly cheaper[35] than installing pipework in the highway (hard dig) due to the ease of excavation, reduced risk of installing pipework alongside other infrastructure, ease of reinstatement and reduced impact on the community (e.g. no closure of the highways).

[35] https://communityheat.org.uk/techno-economic-model/pipework-costs/

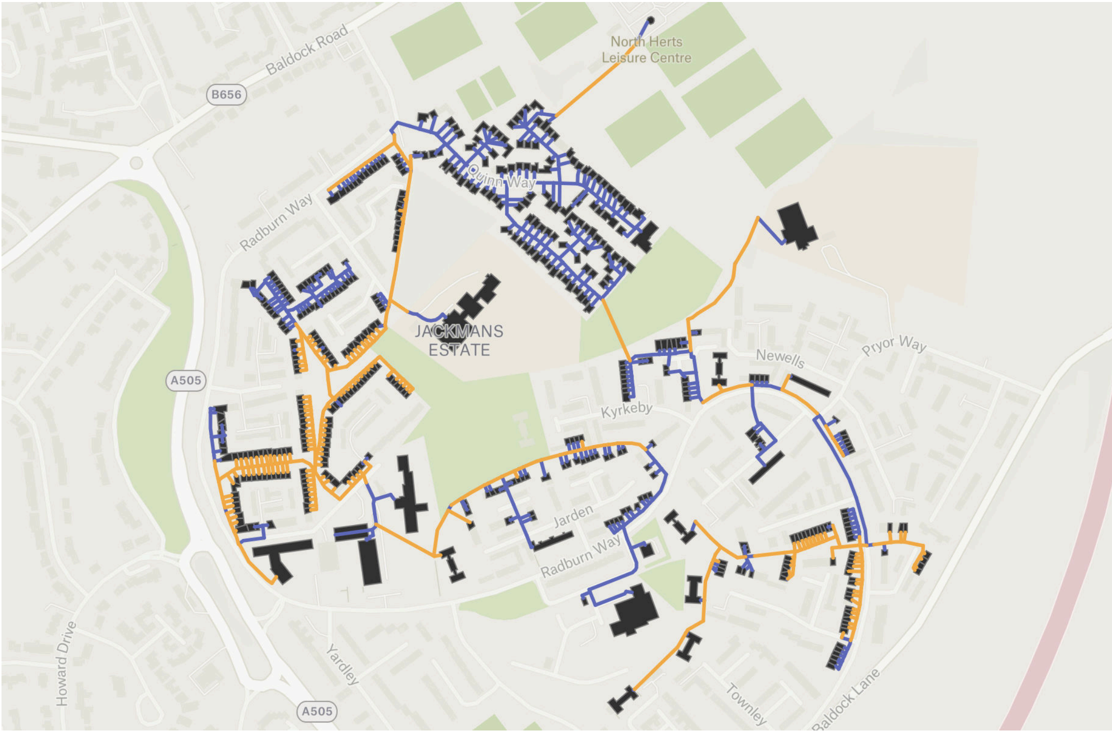

Figure 21: Soft dig (orange) and hard dig (blue) trench routes

Figure 21 illustrates the pipework routes identified as soft dig and hard dig. Approximately 45% of the network route has been identified as suitable for soft dig.

Network Pipework	
Pipework	£1,999
Trenching and Installation (~45% soft dig)	£5,160

Table 11: Pipework purchase and installation CAPEX costs (£k)

9.2.3. Energy Centre, Wind Turbine and Project DEVEX

Energy Centre (£k)	
Heat pumps	£1,542
Coolant pumps	£250
Backup boilers	£403

Energy Centre (£k)	
Thermal storage	£187
Energy Centre Building	£450
Renewables (£k)	
Wind turbine purchase and installation	£4,031
Cabling between generator and connection point	£150
Grid connection	£498
Planning, design & regulatory costs (£k)	
Commissioning costs	£924
Design & Project Management	£1,848

Table 12: Details of CAPEX costs (£k)

9.2.4. Summary of CAPEX

The total CAPEX costs are reported in Table 13 alongside the total amount of GHNF that may be available.

Summary of CAPEX Costs (£k)	
Energy Centre	£2,833
Network Pipework and Trenching	£7,158
Customer Connections (£4,881 per property)	£3,807
Renewables	£4,679
Planning, design & regulatory costs	£2,772
Contingency	10%
Total	**£23,098**
Eligible for GHNF grant	£21,326
GHNF grant amount	£6,023
Total excluding GHNF grant	**£17,358**

Table 13: Summary of CAPEX costs (£k)

9.3. Replacement Costs

Energy Centre (£k)	
Heat pumps	£1,542
Coolant pumps	£250
Backup boilers	£403
Thermal storage	£187
Customer Connections and HIUs	
Internal works and HIUs	£2,106
Renewables	
Wind turbine purchase and installation	£4,031
Total	**£8,519**

Table 14: Summary of REPEX costs (£k)

9.4. Ongoing Costs

9.4.1. Administration

The cost of running a Community Benefit Society (CBS) will vary depending on whether the day to day administration is carried out by the organisation's Directors or externally by an administrative service. It is recommended that a scheme of this size and complexity should use external administrators. The annual cost of running a CBS set-up to own the proposed Letchworth heat network is estimated to be around £10,000.

9.4.2. Metering and Billing

The staff costs for metering the system and billing customers are assumed to be approximately £95.00 per connection per year. In Letchworth the annual costs for metering and billing is expected to be around £74,100.

9.4.3. Insurance

Insurance costs for renewable energy assets vary depending on the technology. For wind installations, insurance is typically around £2,993/MW[36]. In addition, insurance for the heat network is estimated at £5,000 per year.

9.4.4. Rent and Rates

For energy centre

An allowance of £1,000pcm has been included for rent. It is understood that buildings whose main use is for a 'heat network' are exempt from business rates.

Land required for renewable generation

The land required for any connected renewable generation will also be subject to rent. For wind, a rate of £10,000 per MW of capacity of the wind turbine. Annual land rent for a 3MW wind turbine in Letchworth is estimated to cost around £30,000. Business rates for the 3MW wind turbine are assumed to be £7,500 per year.

9.4.5. Maintenance

Regular maintenance of the components of a heat network are essential to keep it operating efficiently and reliably over its lifetime. Annual maintenance costs for the proposed network in Letchworth include:

Energy Centre	
Component	Total annual cost (£)
1% of CAPEX on thermal storage	£1,870
1% of CAPEX backup boilers and network pumps	£6,430
Heat pump	£4,510
Land rent	£12,000
Total	£24,910

Table 15: Annual maintenance costs for components in the Energy Centre

[36] Inflated to 2025 prices from Solar and Wind Insurance Costs: Onshore wind and solar PV costs review, BEIS/WSP, 2020

Network		
	£/MWh	**Total annual cost (£)**
Network (pipes etc)	£0.60/MWh	£6,650[37]
HIUs	£80/connection	£62,400
Total		£69,050

Table 16: Annual maintenance costs for components in the network (£k)

Renewables	
Wind	£83,080

Table 17: Annual maintenance costs for renewables (£)

9.4.6. Cost of finance

Loans have been modelled at the following rates and terms.

Loan type/purpose	**Rate**	**Term**
Development loan	8%	2 years
Equipment loan	5.95%	25 years
Pipework loan	5.35%	50 years

Table 18: Assumed loan rates and terms

9.5. Overall Financial Performance of Heat Network

9.5.1. Year 1 Cashflow

The expected year 1 cashflow is detailed in Table 19.

[37] Includes total demand + pipework losses

Income (£k)	
Electricity sales to grid	£390
Electricity sales to offtaker via direct wire	£162
Heat unit sales	£663
Heat network standing charge sales	£293
Sub-total	£1,507
Outgoings	
Operations and Maintenance	£313
Electricity purchase from grid	£70
Gas purchase for back-up boilers	£87
Loan repayments	£1,229
Sub-total	£1,698
Year 1 Cashflow	-£191

Table 19: Year 1 Cashflow (£k)

9.5.2. Payback Period and Project IRR

The Internal Rate of Return (IRR) is a financial tool used to assess the economic viability of a project. It represents the overall rate of return the project is expected to generate over its lifetime. If the project IRR exceeds the required rate of return, such as the cost of capital, it suggests the project is likely to:

- Cover its costs
- Remain financially stable over time
- Offer modest returns to shareholders, helping justify community investment
- Strengthen the case funding or grant applications.

Conversely, if the IRR falls below the required rate of return, the project may struggle to meet its financial obligations and may be considered financially unviable.

The 25 year project IRR for the proposed heat network in Letchworth is **4.8%**, assuming £6m of capital grant funding, indicating that the project is expected to generate a return below the cost of capital. This suggests the project is not financially viable, and is not expected to be able to cover its costs, maintain financial stability, nor deliver returns to community shareholders.

10. Sensitivity Studies

10.1. Extension of the Boiler Upgrade Scheme

The BUS will currently only award £7,500 for the installation of an individual ASHP or ground source heat pumps (individual or on a shared ground loop) and will not fund connections to a low carbon heat network. There is the possibility that the planned changes to the Warm Homes schemes to fund connection to low carbon heating networks get extended to the BUS. If this were to happen then the £7,500 BUS grant could be used to partially fund the cost of connecting the 48% of homes in Jackmans Estate which do not qualify for funding under the Warm Homes schemes, to the proposed heat network. A comparison of the heat network scheme finances with and without the BUS grant is presented below.

Sensitivity to the Boiler Upgrade Scheme Grant		
BUS Grant per Eligible Property	£0	£7,500
Average Connection Cost	£4,881	£1,281
Year 1 Loan Repayment	£1,229	£958
Year 1 Cashflow	-£191	£80
Initial Payback Period	N/A	23
25 Year Project IRR	4.8%	7.1%
50 Year Project IRR	6.4%	8.1%

Table 20: Sensitivity of heat network scheme finances to BUS grant

If the BUS was extended to partially fund the cost of connecting domestic properties to a low carbon heat network, the proposed network at Jackmans Estate would be financially viable. The BUS grant funding would reduce the size of the loan required resulting in a 20% reduction in annual loan repayments, and a positive year 1 cashflow of £80,000. It is anticipated that the scheme would achieve payback after the first 23 years of operation.

10.2. Installing a Larger Wind Turbine

The base case assumes a 3MW wind turbine with a tip height of approximately 125m would be installed to provide much of the electricity to the network heat pumps, supply North Herts Leisure Centre with electricity behind the meter and generate additional income by exporting any excess generation to the grid. The wind constraints assessment completed by Sharenergy indicated that there is space for a 4.26MW wind turbine with a tip height of 150m instead of a 3MW turbine. It is generally more economical to install a larger wind turbine since the increased income from the greater annual generation tends to outweigh the increased development costs. A community owned wind turbine of this scale has been developed in England before by Ambition Community Energy[38] in Lawrence Weston, Bristol.

A comparison of the heat network scheme finances for a 3MW and 4.26MW wind turbine are reported below.

Sensitivity to Size of Wind Turbine			
Wind Turbine Power Rating	3MW	4.26MW	4.26MW
BUS Grant per Eligible Property	£0	£0	£7,500
Average Connection Cost	£4,881	£4,881	£1,281
Year 1 Loan Repayment	£1,229	£1,415	£1,143
Year 1 Cashflow	-£191	-£107	£165
Initial Payback Period	N/A	N/A	22
25 Year Project IRR	4.8%	5.4%	7.5%
50 Year Project IRR	6.4%	6.9%	8.4%

Table 21: Sensitivity of heat network scheme finances to wind turbine power rating

Including a larger, 4.26MW, wind turbine improves the financial performance compared to including a smaller wind turbine despite the loan repayments being

[38] https://ambitioncommunityenergy.org

higher. This is since the turbine is able to supply more of the electricity consumed by the network ASHP and earn more income through export of electricity to the grid.

If the BUS was extended to partially fund the cost of connecting domestic properties to a low carbon heat network, including a 4.26MW wind turbine in the scheme is estimated to ensure the initial payback period of the scheme will be 22 years. The combination of the larger wind turbine and BUS funding could also reduce the amount of funding the scheme would need to be awarded making an application to the GHNF more competitive. It is estimated that the scheme could achieve initial payback in 24 years with a GHNF grant based on a rate of 3.5p/kWh (for heat delivered in the first 15 years) rather than the maximum, and less competitive, rate of 4.5p/kWh.

10.3. Equipment Loan Term

The base case splits the loans into two parts. The loan for the cost of purchasing and installing the pipework are modelled over a 50 year period, the minimum expected lifetime of the pipework. And the loan term for purchasing the energy centre equipment, ASHP and renewable generation is modelled as 25 years to reflect their shorter lifespan. An alternative scenario has been considered where the loan terms for the equipment and pipework are both set to 50 years which improves the financial performance of the heat network during its early years due to the annual load repayments being smaller.

Note that the loan term for loans required to renew the energy centre equipment, HIUs and renewable generator continue to be modelled as 25 years.

Sensitivity to Equipment Loan Term		
Equipment Loan Term	25	50
Pipework Loan Term	50	50
Year 1 Loan Repayment	£1,229	£1,003
Year 1 Cashflow	-£191	£35
Initial Payback Period	N/A	44
25 Year Project IRR	4.8%	4.8%
50 Year Project IRR	6.4%	6.4%

Table 22: Sensitivity of heat network scheme finances to equipment loan term

Assuming a 50 year loan term can be agreed for equipment and pipework at an interest rate of 5.35%, the proposed heat network scheme could be financially viable, with an initial payback period of 44 years.

11. Carbon Projections

11.1. Establishing the Counterfactual

To assess the carbon savings from a heat network, the first step is to define the baseline, i.e. what emissions would have been generated if the heat network were not built, based on the existing heating mix in the focus area. This is compared to the following scenarios:

- Individual air source heat pumps (ASHPs)
- Centralised heat network with ASHP

Assumptions used:

- Number of buildings connecting to the network: 827
- Total annual heat demand: 8,923,000 kWh
- Average per building demand: 11,090 kWh/year
- Emissions calculated using 2025 UK Government GHG conversion factors (kg CO_2/kWh)

11.2. Emissions from Existing Heating Systems

The mix of heating systems in the proposed Letchworth heat network focus area is discussed in section 5, using data from the 2021 Census. The emissions factors for the different heating systems in the network focus area, adjusted for fuel efficiencies, are presented in Table 23.

Heating type	Proportion of Properties	Fuel CO2 emissions (kg CO2e)	% Assumed efficiency	Emissions per kWh heat (kg CO2e)
Mains gas only	83.6%	0.18296	90%	0.203
Electric only	5.3%	0.2072	100%	0.207
Tank/bottled gas only (LPG)	0.6%	0.2145	85%	0.252
Oil only	0.3%	0.26813	85%	0.315
Wood only	0.1%	0.0115	75%	0.015
Solid fuel only	0.0%	0.34721	85%	0.408
No central heating	0.4%	Left out as baseline undefined		
Mixed/Other	8.5%	0.22	100%	0.220

Table 23: Emissions factors and efficiencies for heating types in Jackman's Estate

Baseline carbon intensity: 0.195 kg CO_2/kWh heat
Annual emissions: 1,742,243 kg CO_2
Per building: 2,107 kg CO_2

11.3. Comparison of Heat Scenarios

Table 24 presents the annual CO_2 emissions of buildings included in the proposed Letchworth heat network. The carbon intensity of electricity consumed from the grid has been averaged across the 50 year project lifetime using projections of grid carbon intensity published in the UK Government Treasury's Green Book[39].

39 https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Scenario	Total annual emissions (tonne CO_2e)	Per building on network (kg CO_2e)	g/CO_2e per kWh of heat
Existing heating mix	1,742	2,1071	195
Heat Network Current Grid[40]	319	409	36
Heat Network Future Grid	263	337	29
Individual ASHPs Current Grid[41]	571	732	64
Individual ASHPs Future Grid	70	90	8

Table 24: Annual emissions of the buildings including in the proposed heat network, averaged over 50 year project lifetime

The analysis shows that developing a low carbon heat network in Jackmans Estate is expected to reduce annual CO_2 emissions by 85%. Each year, the heat network is expected to save 1,479 tonnes of CO_2 emissions which equates to 73,950 tonnes across the 50 year lifetime of the network.

The heat network offers carbon savings over individual ASHPs of ~45% assuming the carbon intensity of the grid remains at 2025 levels. However, it is anticipated that over the 50 year project lifetime individual ASHPs would reduce CO_2 emissions more than the heat network based on the projected trend of grid decarbonisation. This is due to the network's use of back-up / top-up gas boilers to provide ~10% of the network's annual heat demand, however these could be replaced by electric boilers in the future as the relative cost of electricity vs gas reduces.

It is worth noting that, in England, the Green Heat Network Fund grant requires heat network projects to demonstrate carbon emissions of less than 100gCO_2e/kWh but does not explicitly promote projects offering significantly greater carbon savings. The proposed heat network at Letchworth is expected to reduce carbon emissions to a level which is 29% of the maximum emissions required by the GHNF.

[40] Assuming an ASHP SCOP of 3.10.
[41] Assuming a SCOP of 3.24.

12. Planning and Permitting

12.1. Current Planning and Permitting Regulations

Community-scale heat networks are subject to a combination of national planning policy, local planning regulations and environmental permitting requirements.. While there is currently no single unified permitting process for heat networks, key regulatory considerations include:

- Underground works: consent may be required for trenching and pipe-laying under highways or public land.
- Above-ground infrastructure: the energy centre may require full or prior approval from the local planning authority
- Environmental and noise assessments: particularly as the energy centre includes a large heat pump.
- Building interfaces: if retrofitting public or private buildings, additional listed building consents or landlord approvals may be required.

12.2. Heat Zoning: Current Context and Future Direction

The Department for Energy Security and Net Zero (DESNZ, formerly BEIS) has been developing heat zoning as a key policy tool to support the decarbonisation of heat, focusing public and private investment on areas where heat networks are likely to be the most viable and cost-effective solution (when compared against on-grid gas central heating as a counterfactual).

Preliminary national analysis has not identified Letchworth as a potential future heat network zone, based on building density, heat demand and the presence of suitable anchor loads. However it is possible that Letchworth may be identified as a heat network zone in future.

This has important implications for future development. Under the forthcoming statutory zoning framework (expected from 2025 onwards), only designated heat network zones will be actively supported and potentially prioritised for:

- Mandatory building connections,
- Targeted funding,
- Streamlined planning,
- Regulatory oversight, and
- Centralised delivery support.

As such, projects outside these designated zones may not be considered part of the government's formal heat decarbonisation strategy. This could mean reduced access to policy support, funding opportunities, and regulatory mechanisms intended to accelerate network deployment within zones.
While the proposed Letchworth heat network demonstrates strong local and environmental value, particularly through community-led ownership and place-based benefits, its location being potentially outside a designated heat zone may present additional challenges, including a more complex or fragmented planning and permitting route, lower priority in funding or investing pipelines, and the absence of regulatory levers (e.g. mandatory connections) that improve viability in zoned areas.

13. Operation and Governance

If the scheme progresses, there are five options:

1. Set up a new, local, Community Benefit Society (CBS). A CBS would enable a share offer to be launched giving community ownership for the scheme. This CBS could also own the new wind turbine. This would however be a big commitment for a group of volunteers, on a project with a 50 years lifespan, even if admin support was provided as has been allowed in the costings. It would also be a relatively risky investment for the investors as there is very little leeway in the finances for extra costs or reduced revenues.
2. Partner with an existing local CBS, such as River Ivel Community Energy although they have not suggested they would take on such a scheme. The advantage of using an existing CBS rather than a new CBS is that they have access to wider resources and expertise and could then consider delivering similar schemes elsewhere.
3. Partner with a specific Heat Network CBS. If a local CBS were to develop a heat network in Morecambe, they will need a high degree of support. We envisage a federated system where multiple individual societies are supported by a specialised centralised development, advice and administration service with the addition of well supported peer to peer learning between the societies.
4. Partner with a Local Authority who can take the lead and raise the capital required. This is how the Swaffham Prior scheme is being delivered. At the moment only Local Authorities have the power to dig up roads for installing Heat Network pipes so some sort of council partnership may be

required anyway. This arrangement would relieve the pressure on the local volunteers and remove the risk from the shareholders, but the scheme could then be bound up in the workings of local government.

5. Partner with a private sector company to deliver and run the scheme on a commercial basis. This would reduce the workload and responsibility for community volunteers but would also give less local control. The rates of return are also not likely to be attractive enough to a private enterprise.

14. Alternative Local Energy Scheme

While the Community Heat Development Unit project focuses on centralised district heat networks, an alternative approach has been identified in the Bishop's Castle case study[42]. This model adapts the Energy Local[43] concept, with a locally installed wind turbine supplying much of the electricity consumed by participating households. Revenue from electricity sales would then be used to service loans taken out to cover the part of the cost of individual ASHPs installations in domestic properties. Jackmans Estate is theoretically well suited to the proposed distributed heat and wind scheme since most of the area is supplied with electricity from a single primary distribution substation, East Letchworth primary substation Figure 22, meaning that electricity generated by the proposed wind turbine could be distributed locally. This style of scheme is dependent on the P441[44] modification to the local energy trading rules being finalised and approved, without which it could not be implemented.

[42] https://stcenergy.org.uk/bishops-castle-heat-and-wind-project/
[43] https://energylocal.org.uk
[44] https://www.ofgem.gov.uk/decision/dcp441-proposal-increase-number-allowed-change-report-alternative-variations-two-three-authority-decision

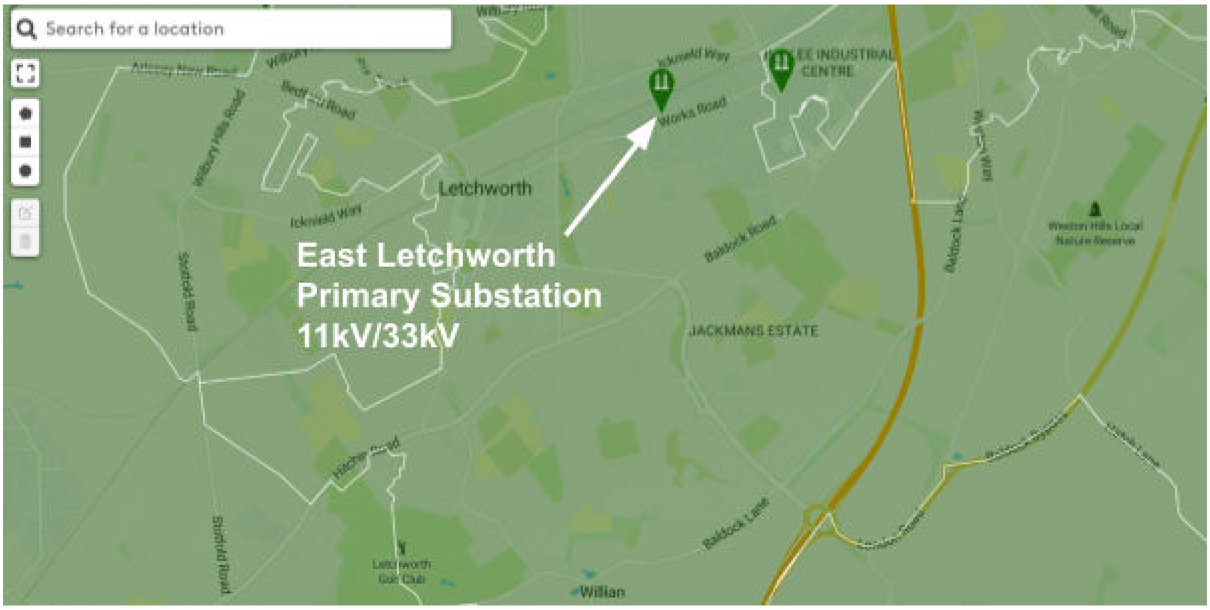

Figure 22: Primary substation area (boundary signified by white line)

Further details of such a scheme are discussed in the CHDU Bishop's Castle case study report. It is anticipated that an equivalent scheme in Jackmans Estate could be more financially viable, and support more homes, due to the proposal of installing a larger, multi-megawatt wind turbine.

15. Next Steps

The proposed low carbon heat network in Jackmans Estate is not deemed to be financially viable even with substantial grant funding from the Green Heat Network Fund. For the scheme to be financially viable, the following criteria must be met:

1. Green Heat Network Funding at a rate of 4.5p/kWh for the first 15 years of heat delivered. This is the maximum amount of grant funding available.
2. An expansion of the Boiler Upgrade Scheme to fund connection of households to a district heat network.
3. Development of a local 3MW wind turbine to provide much of the power to the network.

If the above criteria were met, the scheme finances would improve significantly and the project would become financially viable, achieving an initial payback period of 23 years and a reasonable 25 year project IRR of 7.1%.

Local support for such a scheme is yet to be established. An in-person meeting in Jackmans Estate was poorly attended by local residents and, although the main social housing provider, Settle, are interested in the outcome of this study, their focus is currently on improving the energy efficiency of their housing stock. It is essential that local community support is demonstrated for a community owned heat network scheme to progress. It is anticipated that attendance of scheme advocates at local events will be essential in establishing local support. Local advocates for such a scheme should get in touch via chdu@sharenergy.coop to register their interest and continue discussions about how a scheme could be progressed.

Developing a better understanding of the main capital costs required to develop the proposed low-carbon heat network scheme for the specific network route and housing stock in Jackmans Estate may improve the scheme's financial case. Gaining a number of quotes for purchasing and installing the network pipework, including a more accurate assessment of the proportion of the network which can be installed using soft dig, may help reduce costs. Likewise, there is limited experience in the UK of retrofitting buildings of the types in Jackmans Estate to a heat network so generalised building connection costs have been assumed in this report. It is recommended that alternative options for retrofitting the buildings in the estate are investigated to better establish the true costs. For example, the terraced housing, of which there is a high proportion, could potentially connect to the network via pipework which runs through the loft space of adjoining properties, reducing the amount of pipework which must be installed in the ground. Additionally, network pipework could potentially be run up the outside of the blocks of flats and enter individual properties where the existing gas boiler flues are installed.

While development of the proposed heat network is not currently financially viable, a number of potential wind sites have been identified in the area. A wind only project may be viable which generates income from selling behind the meter electricity to North Herts Leisure Centre, exporting any excess generation to the national grid. It is anticipated that a local wind project would become increasingly viable if the P441 modification to the local energy trading rules is implemented and may be able to reduce the electricity bills of residents of Jackmans Estate using an Energy Local style approach.