REPORT

Retrofitting Heat Pumps in London's Community, Arts & Leisure Buildings

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Acknowledgements

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Cover image: ASHPs at Devas Youth Club, Battersea, courtesy of CREW Energy

Community Energy London (CEL) was formed in 2017 and is a network of people and organisations with an interest in supporting the development of community energy projects across the capital. CEL members have provided guidance and training on fuel poverty alleviation; have developed, fund-raised and installed renewable energy generation projects such as solar PV and anaerobic digestion plant (AD); and worked on energy efficiency projects from insulation to high efficiency LED lighting. CEL provides a route for groups to link up and share experiences, resources, best practice and skills gained through the development and delivery of their projects.

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Executive Summary

A cornerstone of London's pathway to Net Zero by 2030 is the decarbonisation of heat use in buildings. The Government's 2021 Heat and Building Strategy (HABS) has set out the route to achieving this as being largely through the 'electrification of heat' through a mass adoption of heat pumps.

Government support for heat pumps has been forthcoming however this has almost exclusively been targeted at the domestic sector. Some limited programmes are also in place for public sector buildings, and where heat pumps can be used with heat networks. Beyond this, there are virtually no Government policies or programmes in place to support heat pump retrofit in non-domestic buildings.

This report examines the potential and routes for community groups to support the delivery of a heat pump retrofit project in the types of buildings they typically partner with. These include community centres to art venues, places of worship to health and leisure centres.

For the vast majority of these buildings, an onsite heat pump will be their only option to shift their heat supply away from fossil gas heating. A strategy to introduce heat pumps into these buildings could not only have major benefits in relation to carbon saving but also wider impacts in relation to raising public awareness of heat pumps.

In recognition of the built environment limitations within London, **this study is principally concerned with retrofit projects based around the use of Air Source Heat Pumps (ASHP)**, however much of the analysis of community buildings in London and recommendations to community energy groups will be equally valid for Ground Source Heat Pump (GSHP) projects.

To achieve Net Zero, all of these community buildings will need some level of retrofit and a change to their heating systems. Following on from analysis published by the Greater London Authority (GLA) on the potential for heat pump retrofit in London, the focus of this study is:

1. **To examine the scale of the potential for retrofitting community buildings in London with heat pumps.** We have undertaken analysis of UK Power Networks (UKPN) extensive Distributed Future Energy Scenarios (DFES) data sets, specifically for London, to estimate the number of community buildings across the city, their heat demand and hence potential for the use of heat pumps.

2. **To explore the challenges involved in decarbonising the heating of these buildings and set out options and opportunities for overcoming them**. We have set this out through detailed guidance aimed for community groups who are looking to develop a heat pump retrofit project. This work has been

informed by working closely with London community groups who are either undertaking feasibility studies of heat pump retrofits - or in the process of installing a heat pump.

Potential

Using UKPN's Distributed Futures Energy Scenarios (DFES) data[1], this report's analysis indicates that:

- There are 14,667 Community Arts and Leisure (CAL) buildings in Greater London representing 8% of the total non-domestic buildings' total area, and 8% of its energy demand - equivalent to 1.15 TWh of heat per annum
- 68% of these CAL buildings use gas as their main source of heating
- As hot water demand in the CAL sector is very low, Air Source Heat Pumps are considered a suitable technology and good fit for heat decarbonisation in this sector

Barriers

Whilst subsidy-free models for solar PV projects have been developed over the past few years by community energy groups, there is no similar model that can be applied for the decarbonisation of heat. Applying a standard financial model to calculate return on investment will not stack up. **Some of the key barriers highlighted in the report are as follows:**

- Heat pumps are the primary technology choice for decarbonising heat in existing London buildings, yet are still relatively unknown. The public are unclear of different technology options available to them, with mixed messages about the suitability, associated risks and potential disruption of these options.

- There are few examples of successful retrofit heat pump projects in non-domestic buildings (by anyone, not just community groups) to help inform new ones[2]. Likewise, very little in terms of guidance. Few community energy groups have the resource or expertise to deliver such complicated projects in a new field such as this. Skills in areas such as building physics, engineering, technical review and multi-level procurement may not be commonplace in groups, along with complex project and stakeholder management skills.

[1] See https://www.ukpowernetworks.co.uk/our-company/dfes-2023

[2] Over the past two years, more ASHP retrofits have gone ahead in public sector buildings as a result of Government funding - see Appendix 4 for further information of such projects in London.

- The multifaceted nature of renewable heat systems introduces a large amount of uncertainty, both in the performance and associated costs. This is a major barrier for community groups who, in most cases, are unable to offer a return on investment to funders, nor potentially convince decision makers to go ahead with the investment.

- ASHP have higher up-front costs than replacement gas boilers or electric heating systems[3]. ASHP costs can vary significantly based on the specific details of the installation, availability of heat source, ancillary works required and the specific technology chosen. Other more pressing refurbishment work often takes precedence over low carbon heat or energy efficiency improvements, especially if these would disrupt business as usual activities. The low status of energy efficiency work and divergent interests contribute to these organisational barriers.

- The decision-making processes for the adoption of a new renewable heating system is complex. A holistic approach to understanding a building's physics is essential to avoid unintended consequences of retrofit, specifically when changing the fabric. Heat pumps are not a like-for-like replacement for gas boilers or conventional electric heating and good practice system design is essential[4].

- Critically, unlike the Boiler Upgrade Scheme (BUS) for domestic properties[5], there is no equivalent support scheme to incentivise non-domestic heat pump instals.

- The installation of air source heat pumps on non-domestic land is not within permitted development, and will require an application for planning permission to the local authority.

- Whilst most London councils have now declared a climate emergency, there is a lag in developing the associated policy and procedure changes within departments to facilitate low carbon retrofit in buildings.

- There are very few Trustmark approved installers, and again, this is directed towards the consumer market, rather than commercial.

- Zero rate VAT for equipment and installation of heat pumps is only available for residential buildings[6].

[3] Heat pump retrofit in London | The Carbon Trust
[4] Carbon Trust - *Heat pump Retrofit in London*, GLA 2021
[5] Apply for the Boiler Upgrade Scheme: Overview - GOV.UK
[6] Energy-saving materials and heating equipment (VAT Notice 708/6) - GOV.UK

Recommendations

Based on the analysis we have undertaken in this study, and real world experience of groups progressing ASHP projects, we make the following recommendations to Central Government, Local Authorities and to community groups:

Central Government

- **Funding -** Introduce routes to financially support heat pump retrofit in community buildings. Options include:
    - Extending the Boiler Upgrade Scheme (BUS) to cover community scale boiler replacement (eg. up to 100kW capacity, or multiple smaller units)
    - Include funding for community-led heat pump retrofit within future rounds of the Public Sector Decarbonisation Scheme (PSDS)
    - Extend and expand the recently announced community energy fund[7] to provide additional support to developing heat pump projects
    - Provide a loan facility via the UK Investment Bank (UKIB) for community-led whole building retrofit
- **New policies -** introduce new place-based community led retrofit programmes. Local Area Energy Plans (LAEPs) are potentially a start for this, along with wider planning reform.
- **Unlock the potential -** realise the wealth of energy, expertise and capital within a community by designing retrofit funding programmes to encourage greater collaboration between councils and community groups.
- **Administration -** make it easier for community groups to apply for funds, from simpler criteria and processes, to streamlining the monitoring and evaluation reporting. Allow more time and provide funds in advance (community groups have little working capital).
- **Planning -** amend the National Planning Policy Framework (NPPF) to include ASHPs on non-domestic buildings within permitted development rights; and remove requirement for ASHPs to be >1m from the boundary.
- **Standards -** Energy Performance Certificates (EPCs) to move away from a cost-based metric towards carbon; non-domestic Minimum Energy Efficiency Standard (MEES) to be implemented and enforced properly.

[7] *Communities at the heart of new fund to boost local growth and energy security*, DESNZ Press Release, 11 August 2023

Local Authorities

- **Awareness -** promote demonstrator projects and engagement initiatives in community buildings to provide confidence in heat pumps
- **Partnership -** procure the services of community groups to identify and develop ASHP retrofit projects
- **Planning -** strengthen and align Local Plans across authorities, ensuring supplementary planning documents support and fast track applications for heat pumps in community buildings
- **Funding -** utilise carbon offset funds[8] to establish local community energy funds to support community-led ASHP retrofit feasibility studies as well as capital works
- **Education -** develop knowledge and experience of ASHP retrofit across housing, planning, energy, environment teams

Community Groups

- **Skills & Knowledge -** upskill community group members in ASHP technology, heat calculations and fabric first retrofit
- **Share best practice -** between community energy groups across the country, arrange site visits, collaborate on projects
- **Partner with council -** form a close relationship with your local authority, offering valuable expertise in engagement and outreach
- **Finance -** recognise that the traditional business model used in solar PV is not transferable, and that decarbonising heat will require grants, subsidies and other external funding
- **Lobby -** help inform DESNZ on options for the scale of targeted subsidies / grants needed to accelerate the deployment of heat pumps in community scale buildings

[8] For background to this - see *Carbon Offset Funds Report 2021*, GLA, January 2023

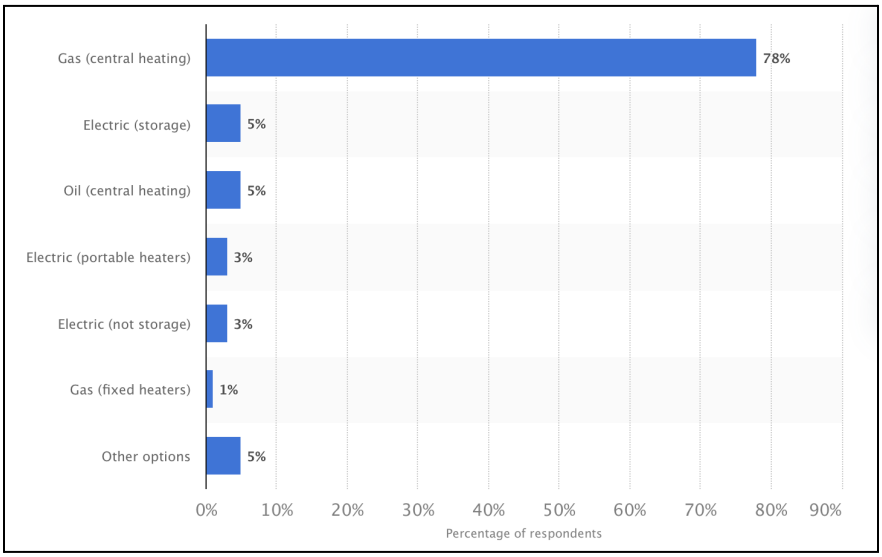
Introduction

The UK has committed to becoming Net Zero by 2050[9]. A major part in achieving this goal will be decarbonising the UK's heat consumption, the majority of which comes from the burning of natural gas - a fossil fuel. The conflict in Ukraine, and subsequent impacts on global energy prices and concerns over security of supply have further increased our need to reduce our dependence on natural gas to heat our buildings.

Although significant progress has been made with regard to reducing carbon emissions from electricity generation, decarbonising heating remains a major challenge. The government has set out its plans for decarbonising our heat supplies through the 2021 *Heating and Building Strategy*. This sets out an ambition to phase out the use of gas boilers with a major shift to the 'electrification of heating' through the uptake of heat pumps.

The government's focus around the introduction of heat pumps however has been on their uptake and adoption in the domestic sector, through policies such as the Boiler Upgrade Scheme (BUS). 78% of householders in the UK heat their homes in the winter primarily using gas, with the remainder using oil (5%) and electricity (5%). Nearly three quarters of the energy used in London's homes is for heating and hot water, and the overwhelming majority of this demand is met using gas-fired boilers[10].

What is the main way you heat your property in the winter?



Source: Statista.com 2023

[9] See *Government policy on reaching Net Zero by 2050*, House of Commons Library Note, 2 June 2023

[10] *London Environment Strategy*,Greater London Authority (GLA), 2017

Little has been done however to explore the wider decarbonisation of heating in non-domestic buildings or the challenges associated with heat pump retrofits in this diverse range of building-types. Much of the research from NGOs and academics has also been limited to examining how to scale up domestic heat pump retrofits.

In this report Community Energy London (CEL) is looking to build on earlier work commissioned by the Mayor of London "*Low Carbon Heat: Heat Pumps in London*" (2018)[11] and a major review by the Carbon Trust: "*Heat Pump Retrofit in London*" (August 2020). **The focus is of this study is:**

> **To examine the scale of the potential for retrofitting community buildings in London with heat pumps. We have undertaken analysis of UK Power Networks (UKPN) extensive Distributed Future Energy Scenarios (DFES) data sets, specifically for London, to estimate the number of community buildings across the city, their heat demand and hence potential for the use of heat pumps.**
>
> **To explore the challenges involved in decarbonising the heating of these buildings and set out options and opportunities for overcoming them. We have set this out through detailed guidance aimed at community groups who are looking to develop a heat pump retrofit project. This work has been informed by working closely with London community groups who are either undertaking feasibility studies of heat pump retrofits - or in the process of installing a heat pump.**

The following should be noted:

- The **focus of the analysis and recommendations of this project will be Greater London,** although examples from other parts of the UK and beyond may be included where relevant.
- The **technological focus of the analysis and recommendations of the project will be on retrofitting of heat pumps.** Recognition will be needed of the importance of other prior interventions – such as fabric improvements – but the project won't explicitly include analysis of the benefits or facilitators of these.
- In recognition of the built environment limitations within London, **this study is principally concerned with retrofit projects based around the use of Air Source Heat Pumps (ASHP)**, however much of the analysis and recommendations to community energy groups will be equally valid for Ground Source Heat Pump (GSHP) projects. It should be noted that GHSP could also be a more appropriate solution for larger-scale new build projects (e.g. One New Change), where heat piles can be installed under the building at the time of construction at relatively low marginal cost.[12]

[11] Low Carbon Heat: Heat Pumps in London, Etude for the GLA, September 2018
[12] UK's first geothermal shopping centre opens in London - The Ecologist, 21 January 2011

Other Technology Options

Natural gas, which is used mainly for space and water heating, makes up 34.5% of London's greenhouse gas emissions[13]. Conventional electric heating also contributes significantly to CO_2 emissions and puts strain on the electricity networks at peak times.

In London, the Mayor has set a more ambitious 2030 target to achieve Net Zero with the GLA stating that to achieve this goal *"there needs to be a significant scaling up in the numbers of buildings being retrofitted and at a faster speed; a massive shift to clean heat technologies in our homes and businesses*".[14]

There are a number of potential technology options to decarbonise heat in buildings, but there are also limiting factors to many of these, especially in the context of London's built environment. This report focuses on the potential of retrofitting heat pumps in community buildings, but other routes to decarbonise heat supplies in the city are being studied by both public and private sector organisations, which include:

- **Heat Networks** - London has good potential for the growth of heat networks and many boroughs are exploring opportunities by working with the Mayor's Local Energy Accelerator (LEA) programme[15], through London Council Retrofit London Housing Action Plan[16] and the government's Heat Network Delivery Unit (HNDU) programme. The government's new Green Heat Network Fund (GHNF) is a three year £288 million capital grant fund providing support for new networks and retrofit and expansion of existing schemes is also a major opportunity to fund new district heating projects. Examples of large scale heat pumps connected to district heating networks are also now being installed in London, such as the recent retrofit of Citigen's heat network[17]. The government's proposed Heat Zoning regulations as set out in the Energy Bill currently going through Parliament has the potential to drive the growth of district heating[18].
- **Secondary or waste heat** - This includes lower temperature heat sources from water and sewage treatment works, or even data centres[19]. To utilise this heat in buildings will require upgrading the temperature of the heat by heat pumps, an example of such a project in London is Islington Council's

[13] London Energy and Greenhouse Gas Inventory (LEGGI), Greater London Authority
[14] London Net Zero 2030: An Updated Pathway, GLA, January 2022
[15] Local Energy Accelerator (LEA), GLA website
[16] Priority F of the Retrofit London Housing Implementation Plan, London Councils
[17] Greening the City: installing heat pumps at Citigen's central London energy centre CIBSE Journal, April 2022
[18] Energy Security Bill factsheet: Heat networks regulation and zoning 1 September 2023
[19] Data Centre Waste Heat Network plans in Old Oak and Park Royal Development

Bunhill Heat and Power Network which is "*the first scheme in the world to take waste heat from an underground train network and use it to provide lower cost, greener heat to local homes, schools and leisure centres*".[20]

- **Energy from Waste** - Incineration of waste has long powered London and schemes are increasingly looking to operate in Combined Heat and Power (CHP) mode, to provide both heating and electricity outputs. The most notable scheme in London at the present time is SELCHP in Southwark/Lewisham, which provides heat to 2,650 homes through a heat network, with plans for its future expansion. Other schemes looking to develop similar heat networks include Riverside Heat Network in Bexley[21], and the Meridian Water network in Enfield[22]. Concerns persist however of London boroughs being locked into long term contracts to burn waste, instead of promoting recycling, as well as potential air quality impacts from waste incineration[23]. London Councils recent London Retrofit Housing Action Plan also states that "*Energy from Waste is one of the highest carbon forms of electricity generation, with emissions of around 890 gCO_2/kWh. This is almost five times higher than the 181 gCO_2/kWh emitted by the UK electricity mix in 2020*"[24].
- **Biomass** - Air quality concerns in many UK cities place major limitations on the combustion of biomass, most notably in London[25].
- **Hydrogen** - The potential for the use of hydrogen through the gas network to help decarbonise heat in buildings in London is not well known, and the government has stated it will not be making its decision on the strategic role for hydrogen and heating until 2026[26]. A 2021 London Energy Transformation Initiative (LETI) study concluded that "*it is unlikely that zero carbon hydrogen supplied via a re-purposed gas mains network will be available for the vast majority of buildings, for the foreseeable future.*"[27] The Mayor's Pathway to Net Zero study concluded that: *"The scenarios assume varying degrees of hydrogen use in London, although in all scenarios it only plays a small but strategic role in meeting the net zero by 2030 target."*[28]
- **Biomethane** – Or green gas is produced from the anaerobic digestion of biomass feedstocks such as food waste – which can be injected into the gas grid (and already take place at sites in London see BioCollectors[29] in Mitcham

[20] See Bunhill heat network, cheaper greener energy | Islington Council
[21] See Cory reaches financial close on Riverside 2 - letsrecycle.com
[22] See Community heat networks - energetik
[23] See https://stop-edmonton-incinerator.org/latest-news/
[24] Page 55, Retrofit London Housing Action Plan, London Councils, July 2021
[25] See https://www.london.gov.uk/programmes-and-strategies/environm
[26] *UK Hydrogen Strategy*, BEIS, August 2021
[27] *Hydrogen A decarbonisation route for heat in buildings*? LETI February 2021
[28] *Analysis of a Net Zero 2030 Target for Greater London*, Element Energy, Final report for Greater London Authority, January 2022
[29] See Check What Happens With Your Waste | Bio Collectors Ltd

and ReFood[30] Dagenham). However, its potential contribution is thought to be only about 5% of current natural gas demand[31] limiting the degree to which biomethane can help to decarbonise the gas grid. The Mayor's report suggests that: "*Biomethane production is assumed to reach its peak in 2030-2035 (depending on the scenario) then remain constant.*" It should be noted however that Net Zero can only be achieved by a significant reduction in the use of natural gas, hence the UK's overall consumption is likely to have to reduce by at least 50% and more[32] - increasing the importance of alternatives such as biomethane. The government's recently Biomass Strategy[33], on an alternative to the Green Gas Support Scheme (GGSS) and introduction of mandatory food waste collections by local authorities are likely to upwardly revise this estimate of the contribution of biomethane.

Heat-pumps As A Deployable Solution

Included in the government's Heat and Building Strategy (HABS)[34] is an ambition for a major boost in the installation of heat pumps to support the decarbonisation of heat in buildings, moving from the present rate of deployment of 35,000 units per year to at least 600,000 per year by 2028 (with approximately 200,000 of the 600,000 target to come from new build domestic properties). HABS states that "*600,000 hydronic[35] heat pump installations per year is the minimum number that will be required by 2028 to be on track to deliver Net Zero.*" The strategy highlights the scale of the challenge stating that the government wants *"manufacturers to scale-up UK production to help meet UK demand and we are aiming for a 30-fold increase in heat pumps manufactured and sold within the UK by the end of the decade".*

In terms of London, analysis published by the Greater London Authority (GLA) in 2022 set out that there will be a need for "*heat pumps [to be] deployed widely in all scenarios to decarbonise heating in the 2020s and early 2030*[36]" if London is to achieve its carbon reduction goals. Of the various scenarios explored, the Accelerated Green pathway indicated a need for 2.2 million heat pumps in London by 2030. To put this in context, the GLA sets out that "t*he number* [of heat pumps] *operational in London is currently much smaller, with just 521 domestic Renewable Heat Incentive (RHI) applications having been made for air source heat pumps from April 2014 to November 2021 the lowest of any region in the UK by far.*"[37] In fact

[30] See ReFood Dagenham Facility | London | Find out more
[31] Committee on Climate Change, 2016, Biomethane Technical Note
[32] See pp 127 and 128 of Future Energy Scenarios (FES) July 2022, National Grid ESO
[33] See section 7.2 Biomass Strategy 2023, DESNZ, 10 August 2023
[34] Heating and Building Strategy, BEIS, October 2021
[35] Air to water (rather than air to air)
[36] *Analysis of a Net Zero 2030 Target for Greater London*, Element Energy, January 2022
[37] *Analysis of a Net Zero 2030 Target for Greater London*, Element Energy, January 2022

the domestic heat pump installs for London under the RHI represented less than 1% of the total for GB.

It should be noted that this research by both the government and the GLA almost exclusively focuses on the deployment of heat pumps in the domestic sector – with little analysis or commentary on the use of heat pumps in larger non-domestic buildings. Similar data for the Non Domestic RHI (NDRHI) for installation of heat pumps for London for the period November 2011 to December 2021 show only 67 instals were accredited out of a total of 3141 – or only 2% of the total for GB. (Note: this includes air source plus large and small ground source and large and small water source heat pumps).

Heat-pump Activity In London

- GLA-commissioned research suggests between 1.8m to 3.3m domestic heat pumps being required to be in place by 2030 across a range of scenarios[38] to achieve London's climate ambitions.
- Nearly all London boroughs have either published or intend to publish a Climate Emergency Action Plan[39], setting emission reduction targets for their own buildings as well as borough-wide goals. Many of these plans include projects for the wider use of heat pumps[40].
- London Councils published a *Retrofit London Housing Action Plan* in October 2021 where Activity 3.4 was to *Enable heat pump roll out*. This was followed up by a *Retrofit Implementation Plan*[41] where Priority E on Heat Pumps included the following series of tasks:
    - *Initiate review of current technology including challenges / gaps and potential solutions, including Identifying the current installation and in use cost gaps. This will inform other tasks.*
    - *Determine the role of enabling measures such as insulation and renewable energy generation.*
    - *Develop a funding and delivery model for different tenures; this potentially will take a phased approach.*
    - *Challenge the current approach to funding heat decarbonisation.*
    - *Pilot engagement and education for residents including demystifying the use of heat pumps.*

[38] *Analysis of a Net Zero 2030 Target for Greater London*, Element Energy, January 2022
[39] Borough Climate Action Plans and Targets | London Councils
[40] See https://www.communityenergy.london/council-climate-emergency-action-plans/ for further information on borough climate action plans
[41] See https://www.londoncouncils.gov.uk/our-key-themes/climate-change/retrofit-london-programme

- London has the second lowest uptake of vouchers under the Boiler Upgrade Scheme (BUS), taking up just 5% of the grant vouchers for ASHPs[42]. This data also shows that applications from non-domestic buildings for BUS vouchers make up just 0.3% of the total received. Whilst a range of alternatives exist, the challenge of London's built environment narrows down choices quickly and it could be argued that progress amongst these options are moving even slower than that of heat pumps.
- The Energy Company Obligation (ECO) has been running for 10 years now, resulting in only 220k measures being installed in London's 3.7m homes, one of the lowest of any region in England. The Social Housing Decarbonisation Fund (SHDF) has so far resulted in 206 measures with just 4 ASHPs being installed; and the Green Homes Local Area Delivery (LADS) and Home Upgrade Grants (HUG) have led to a mere 14,000 measures installed in London, with only 3% being ASHPs. The pace at which these schemes are delivering is woefully slow.
- The government's Public Sector Decarbonisation Scheme (PSDS)[43] has pledged £2.9 billion funding to local authorities and wider public sector organisations across England to drive building retrofit. Many of these have included the installation of heat pumps in buildings such as schools, art and leisure centres, places of worship, council and health buildings amongst others. This boost to the level of heat pump instals should provide a lot more opportunities for better understanding around the retrofit of heat pumps into non-domestic buildings. A list of PSDS-funded projects in London that have involved the installation of heat pumps is included in Appendix 4.

Summary

Decarbonising heat in buildings remains one of the most significant challenges to achieving the Net Zero target - as well as helping reduce our dependence on increasing levels of imported fossil gas. The government has set out that the key route to achieving the 'decarbonisation of heat' is through the 'electrification of heat'. Attempts to promote the uptake of heat pumps in the domestic sector are struggling to make progress but policies to introduce heat pumps in non-domestic buildings have not as yet started. Whilst there are a number of other potential technology options to decarbonise heat in buildings, many of these have major limiting factors as a result of London's dense built environment.

[42] Boiler Upgrade Scheme statistics: January 2023 DESNZ
[43] See https://www.gov.uk/government/collections/public-sector-decarbonisation-scheme

Potential for retrofitting heat pumps in Community Buildings

Community Buildings in London

The number of community buildings in London and their contribution to achieving London's Net Zero target has not been studied to any great extent. As part of a suite of projects, CEL has been working to quantify the number of community buildings in the capital, and assess their potential for retrofit through the addition of technologies such as solar PV and - through this report - ASHPs.

CEL launched an online Community Energy Potential Map[44] in March 2023 to help identify the location of community buildings in London. CEL have worked closely with the GLA and our new potential map incorporates data for each community building identified with that building's energy use and solar potential, derived from the GLA's London Solar Opportunity Map, London Building Stock Model and London Heat Map[45]. **The purpose of the map is to support community energy groups to identify potential sites and organisations to work with when developing projects, and accelerate the deployment of community led energy projects across the city.**

Community building is categorised in Figure 1 below. The main category is based on the Community, Arts, Leisure sector in the Building Energy Efficiency Survey[46] (BEES), and subcategories are based on the London Stock Building Model (LSBM) classification.

[44] See Community Energy London Potential Map for further information
[45] See GLA website for all three maps
[46] Building Energy Efficiency Survey (BEES) - GOV.UK

Category	Sub-categories
Clubs & community centres	• Public/Village Hall / Other Community Facility • Youth Recreational / Social Club • Community Service Centre / Office
Theatres, concert halls & cinemas	• Cinema • Conference / Exhibition Centre • Theatre
Places of worship	• Place Of Worship • Church • Chapel • Mosque • Temple • Church Hall / Religious Meeting Place / Hall
Museums, art galleries & libraries	• Library • Museums • Galleries
Leisure centres	• Indoor / Outdoor Leisure / Sporting Activity / Centre • Activity / Leisure / Sports Centre • Entertainment Complex

Figure 1: Community, Arts & Leisure (CAL) category and subcategories in London

Data Collection

There is no definitive list of London 'community buildings' however CEL has managed to access two sets of robust and complementary data sources which have provided an excellent opportunity in this study to get a sense of the scale and number of these building types in London.

1. UK Power Networks (UKPN) Data[47]

As part of the Heat Street project prepared by Element Energy in 2021 for UKPN, a non-domestic building stock model was developed.

- This dataset indicates that there are approximately 767,000 non-domestic buildings covering 323 million m^2, equal to one-fifth of London's size.
- Annual heat demand in the non-domestic stock is around 31 TWh.

[47] Data for Community, Arts & Leisure (CAL) sector has been extracted from Heat Street Report workbook data which has been provided by Element Energy Ltd for UKPN. UK Power Networks Innovation - Heat Decarbonisation

- The UKPN stock model is spatially resolved at the LSOA level[48], with the non-domestic premises broken down into 81 building archetypes which are based on:
    - Building category:[49] Education, Emergency Services, Health, Hospitality, Industrial, Offices, Retail, ***Community Arts & Leisure***, Storage
    - Form of space heating: Gas, Electricity, Other
    - Building size:[50] Small, Medium, Large

2. Greater London Authority (GLA) Data

A further set of data has been provided by the Greater London Authority (GLA) Environment team. It is based on the GLA's extensive London Building Stock Model (LBSM), which was developed by University College London (UCL) for the GLA[51].

Comparison between data sets:

- In terms of 'community buildings' a comparison of two data sets shows a similar number of buildings in this category (UKPN:14,667, GLA 13,978), but a significant difference in modelled initial heating demand. As such, analysis at category level will use UKPN data, (where community buildings are classed here as 'Community, Arts and Leisure'), whilst analysis at sub-category level will use GLA data as this level of granularity was not available from the UKPN data.

[48] Lower Super Output Area (LSOA)

[49] According to BEIS' Building Energy Efficiency Survey (BEES) and Energy Consumption UK (ECUK) statistics, Heat Street UKPN stocks are classified into nine sectors

[50] For categorising the size, the relative size is used based on BEES's distributions of premise sizes within each sector. 'Small' refers to the smallest 10% of stock (by floor area) in each sector, 'Large' refers to the largest 10% and 'Medium' refers to the remaining 80%

[51] See https://www.ucl.ac.uk/bartlett/energy/research-projects/2021/sep/london-building-stock-model

Community, Arts & Leisure (CAL)

Building Category

As at 2021 there are 14,667 CAL buildings in Greater London with a total floor area of 11 million square metres, representing 8% of the total non-domestic buildings' total area in London and 8% of its energy demand consuming 1.15 TWh of heat per annum.

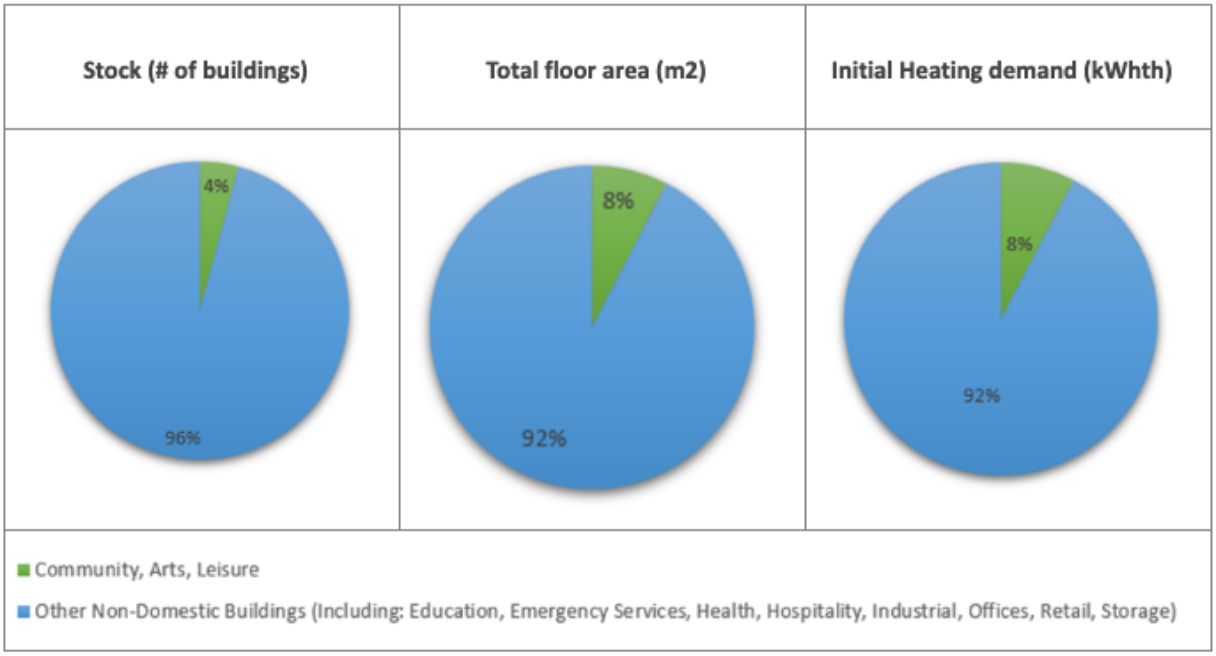


Figure 2: Proportion of **CAL sector** as a % of total Non-Domestic Buildings in London

Building Size

The majority of the building stock in the CAL category (75%) are classed as medium size. While the large size category constitutes only 11% building stock, these larger buildings' heating demand makes up half of the CAL sector's total due to their size.

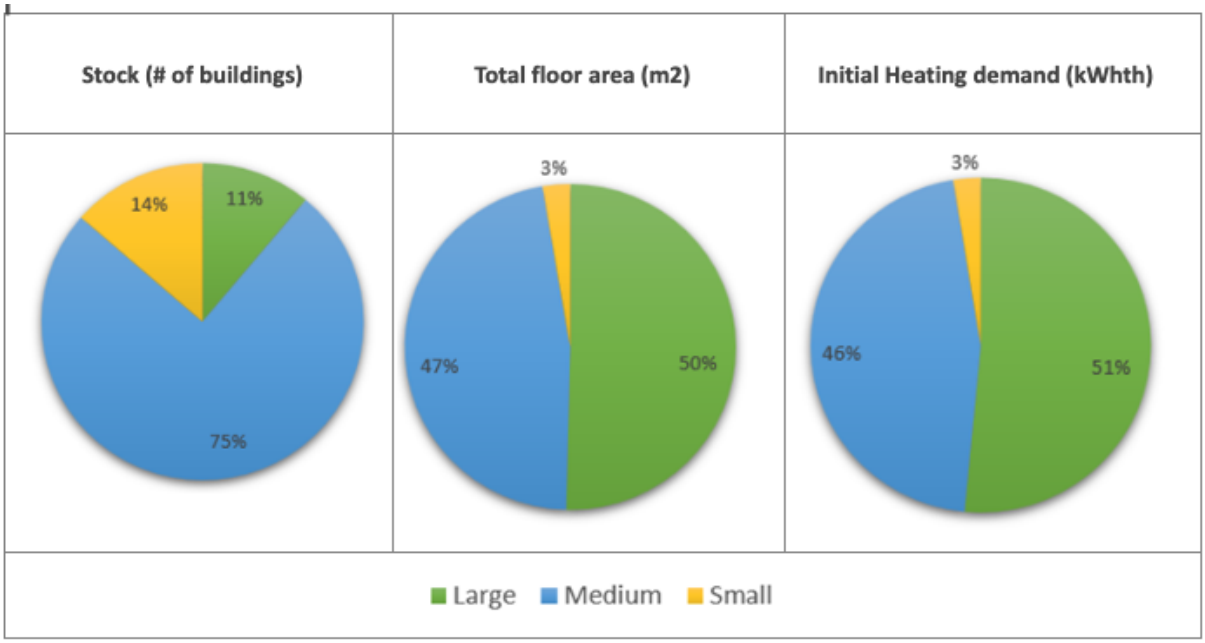


Figure 3: Breakdown of CAL building stock, floor area and heating demand by size

Heating Systems

The chart below provides a breakdown of total heating demand for each archetype sector in the UKPN area. Nearly all of CAL buildings' heat demand is taken up with space heating rather than hot water.

A total of 2.7TWh is needed to provide space heating and hot water in community buildings in UKPN areas, which represents approximately 0.86% of UK electricity generation in 2021.[52]

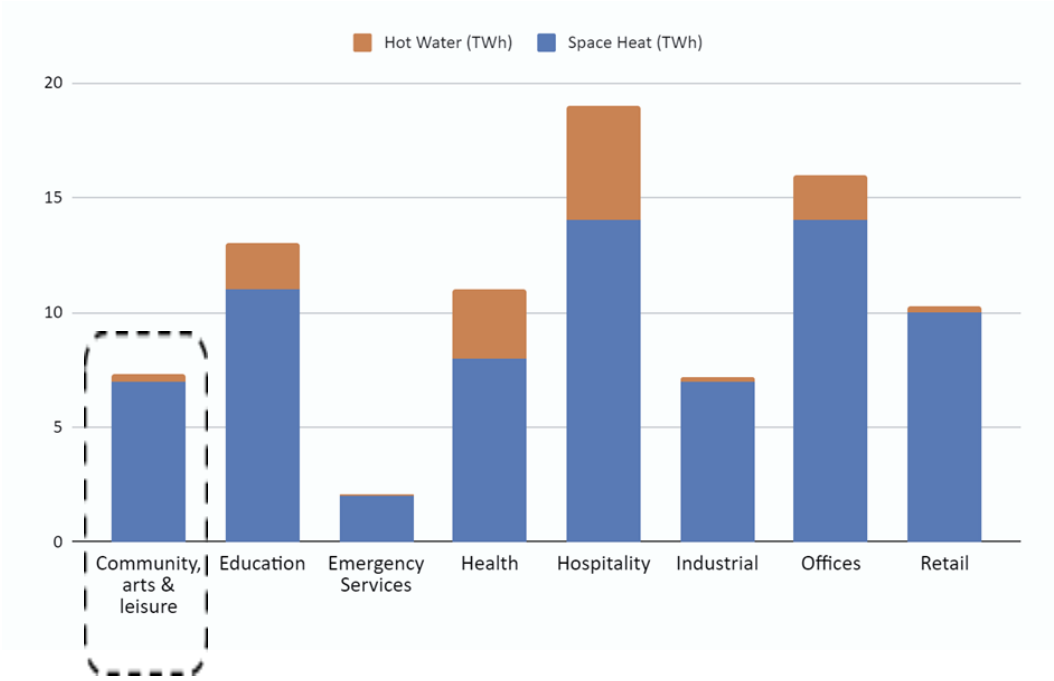


Figure 4: Total heating demand for sectors in the UKPN area

[52]Total electricity generation for UK in 2021 was 317TWh: Energy Trends: UK electricity- July 2022

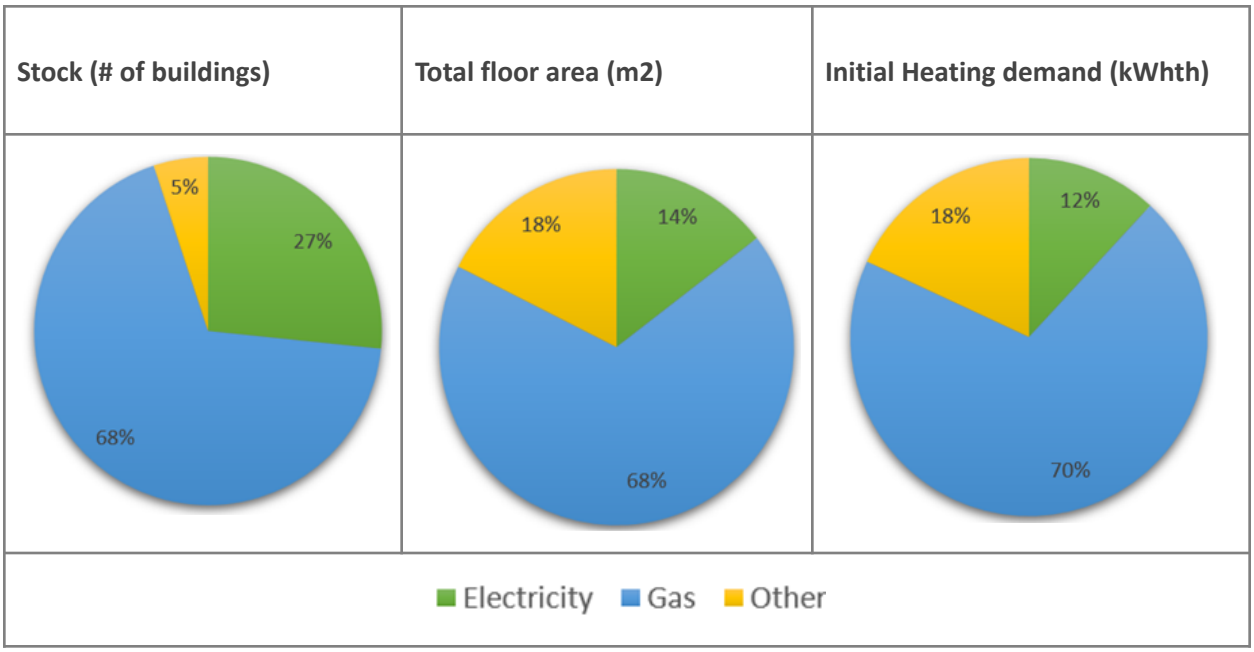


Figure 5: above shows that gas makes up the majority of heating by fuel type by size, floor area and demand

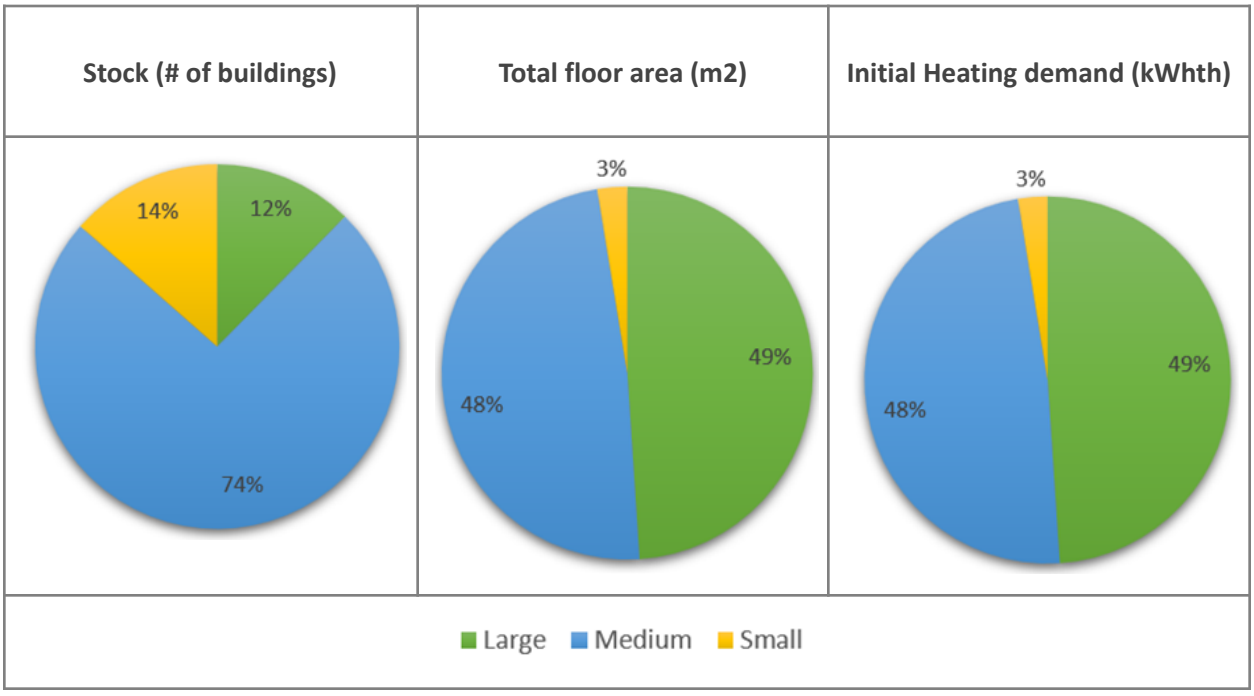


Figure 6: above shows that, proportionally, medium and large CAL buildings contribute 97% of demand between them (48% and 49% respectively), and that medium CAL buildings account for the majority by number

Sub-category levels of CAL

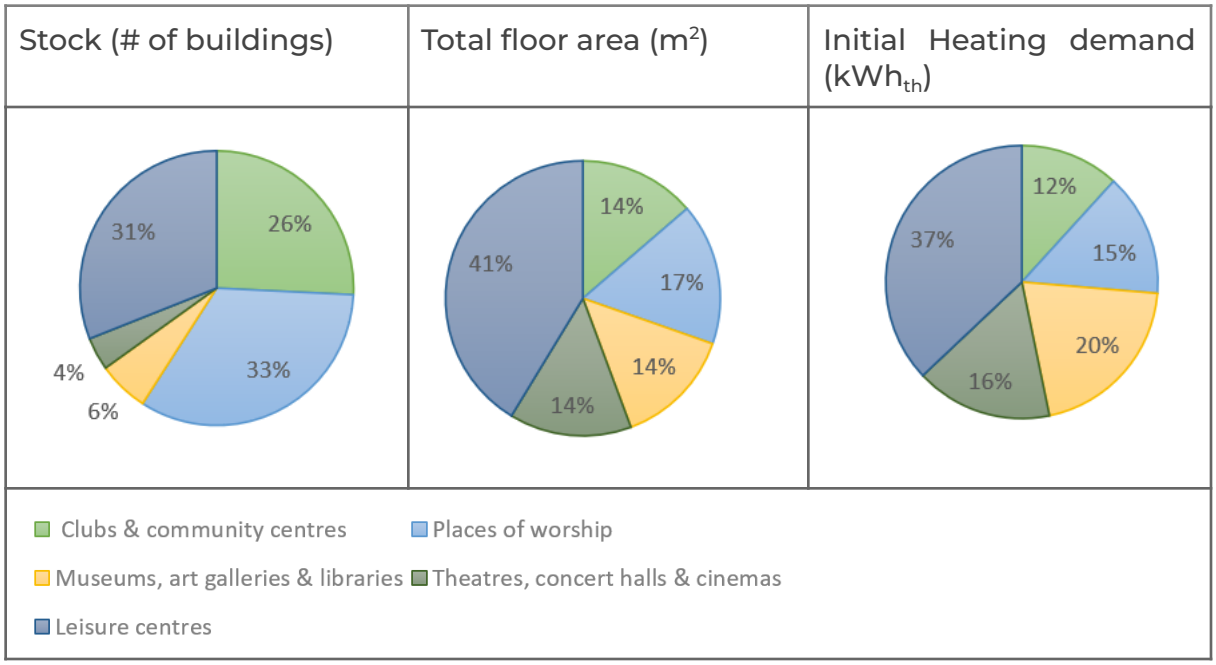


Figure 7: Sub-category levels of Community Arts & Leisure sector (GLA)

Leisure Centres

- Leisure centres typically have the highest heat demand of any individual subcategory within CAL community buildings (37%), often because they have a swimming pool on site[53] which is also ideal for low and slow temperature heat pump technology such as an ASHP.
- They also cover the most floor area at 41% and make up just under a third by number.

CASE STUDIES: London community energy Leisure Centre projects:

PV project at Thamesmere Leisure Centre by South East London Community Energy (SELCE)
PV project at Coldharbour Leisure Centre by South East London Community Energy (SELCE)
PV project at Muswell Hill Golf Club By Power Up North London (PUNL)

[53]See recent example here Newly installed heat pumps at leisure centres helps council stay on track to be carbon neutral by 2030, Wiltshire Council, 1 November 2022

Museum, Galleries & Libraries / Theatres, Concert Halls & Cinemas

Together, museums, galleries, libraries, theatres, concert halls, and cinemas account for over one-third of the community buildings' heat demand, while only 10% of buildings are in these two sub sectors. More than a quarter of the total CAL sector floor area is devoted to buildings in these subsectors, so they are usually considered large buildings.

CASE STUDY: London community energy project:

Solar project and energy efficiency project at Polka Theatre by CREW Energy

Place of Worship

- Nearly one-third of London community buildings are places of worship representing some 15% of total heating demand in the CAL sector.
- The places of worship sub category includes: Church, Chapel, Mosque, Temple, Church Hall / Religious Meeting Place / Hall.
- Halls in some of them are also used as community centres or nurseries in addition to religious activities.

CASE STUDY: London community energy project:

Solar project at St. Anne's Church by Power Up North London (PUNL)

Community Centres and Clubs

- Over a quarter of all community buildings in London are club houses and community centres. These buildings account for 14% of floor area and 12% of heat demand.
- For low carbon projects and solar projects, this sub-sector has been more appealing for community energy groups
- Members of community energy groups are often also users of local community centres and clubs and hence have an interest in ensuring that these facilities can continue to offer their services to residents. Hence they are motivated to act on opportunities to reduce energy bills and support the decarbonisation of this community asset.

CASE STUDIES: London community centre energy projects:

Low carbon project at Devas Club by CREW Energy
Energy efficiency project at https://www.crewenergy.london/drca-lighting.html by CREW Energy
Solar and battery storage project at Islington Sea Cadets by CREW Energy
Energy efficiency project at New Unity by CREW Energy
Solar project at Kentish Town City Farm by Power Up North London (PUNL)
Solar project at Elizabeth House Community Centre by Power Up North London (PUNL)
Low carbon project at Caxton House by Power Up North London (PUNL)

Analysis undertaken for CEL's *Vision for Community Energy in London* study[54], published earlier this year, provided analysis on Energy Performance Certificates (EPCs) of community buildings identified through the GLA's London Building Stock Model.

EPC Rating (Energy Performance Certificate)	Number of community buildings
A	**83**
B	**918**
C	**2,113**
D	**3,890**
E	**2,166**
F	**533**
G	**345**
Number of community buildings without available EPC information	**10,801**

In terms of London's 2030 Net Zero target - virtually all of these buildings will of course still be in place then and will need to reduce their carbon impact. In fact the

[54] *A Vision for Community Energy in London*, Community Energy London, March 2023

vast majority are also likely to be still here in 2050 - the national target for reducing emissions.

The Minimum Energy Efficiency Standard (MEES) regulations are suggesting that buildings need to be EPC ‘C’ rated by 2027. Our data suggests up to 85% of these community buildings currently fall below that level.

Summary of the Potential

- The dataset used identifies 14,667 ‘Community, Arts & Leisure Centre’ (CAL) buildings in Greater London
- 11% of these buildings are classed as ‘large size’ and make up half of the total heating demand of the CAL sector
- 68% of these CAL buildings use gas as their main source of heating and 27% use electricity
- Decarbonisation of CAL buildings can play a positive contribution in reaching London's net-zero energy target since they account for 8% of all heat demand in the non-domestic sector
- Leisure Centres have the most heat demand (and floor area) of any individual subcategories within CAL community buildings at 37%.
- Museum, galleries & libraries / Theatres, concert halls & cinemas by number are the lowest, yet account for 36% of heating demand in the CAL sector
- The majority of building stock is medium size with 75%, and close to half of the heating demand in this sector is for medium size buildings
- Over a quarter of CAL buildings are clubs and community centres, these types have proved successful over recent years in delivering PV projects with community groups and could provide further opportunity for ASHP retrofit
- As hot water demand in the CAL sector is very low, Air Source Heat Pumps are a suitable technology for this sector

Implications for CAL Building Retrofit

- Using extensive datasets from UKPN and the GLA we have estimated that there are between approximately 14,000 CAL/community buildings in London depending on the building types included in this category. We also note that using EPC data from the London Building Stock Model it is clear that *all* of these buildings will need to be retrofitted in order to support the achievement of London’s Net Zero ambition.

- Critical to achieving that Net Zero goal will be in decarbonising the heat supply to these buildings. Heat pumps are a suitable alternative for this sector, there are few other alternatives for these buildings to decarbonise heat.

- Community energy groups will have an active interest in working to help support the decarbonisation of these buildings and to help these building operators. Our next section considers the challenges and opportunities encountered by groups when looking to undertake ASHP retrofits in community buildings.

Challenges & Opportunities for Community Energy Groups

The following section is based on a combination of desktop research and a range of surveys of CEL members and interviews of community energy groups progressing, or with an interest, in developing an Air Source Heat Pump (ASHP) project[55]. These surveys were conducted in Q3 2022 and set out findings of the challenges and opportunities around the retrofit of ASHP projects.

Each section sets out recommendations to groups considering undertaking such projects (green boxes). The surveys also help inform this report's final recommendations to both local and national decision makers about how we can ensure community buildings can play their full role in the decarbonisation of heat in the built environment sector both here in London – and more widely.

The following key issues in terms of heat pump retrofit are considered in turn in the following sections:

- Skills and Knowledge
- Experience
- Agency
- Technical
- Physical
- Financial

Skills & Knowledge

Awareness

- While there remains significant potential in CAL buildings for reducing energy consumption through raising awareness on how to avoid wasting energy and improved energy management - e.g. better use of thermostats, flow temperature and hydraulic balancing[56] - **the greatest potential for emissions reductions remains the uptake of low-carbon heating systems and building refurbishment for improved thermal performance[57].**

- Heat pumps (and low carbon heat networks) are the primary technology choice for decarbonising heat in existing London buildings, yet heat pumps are still relatively unknown to lay people. Although the technology has been around for a long time, there has been little reason to adopt heat pumps when up against such a well established market as that of gas boilers. **The**

[55] See Appendix 1
[56] Climate Change Committee, 2018
[57] Behaviour change, public engagement and Net Zero - Imperial College London, 2019

public are hence unclear of different technology options available to them, with mixed messages about the suitability, associated risks and potential disruption of these options.

- Whilst good progress has been made in the decarbonisation of electricity generation, reductions in UK greenhouse gas emissions from buildings has been less successful. So much so that it now represents the largest single sector contributor (34%), above transport (24%) and energy supply (21%)[58], and of this the majority is for space heating. **The need and benefits of the decarbonisation of heat and moving away from fossil gas as a heating fuel are still not widely appreciated, or communicated by the government.**

- London is home to buildings of all ages, and their energy efficiency varies considerably. More energy is used to heat and power our buildings in London than for anything else. **Buildings are responsible for around four-fifths of London's total GHG emissions and 70 percent of final energy use.**

- **The stop-start nature of energy policy and associated programmes has not helped, with numerous schemes failing to stimulate the necessary mass take up of low carbon technology.** The Mission Zero Review[59] (Skidmore Report) stated that *"Evidence provided to the review has shown that the Net Zero Strategy and other recent government publications have not provided adequate certainty to business and investors. Clearer plans, focused on individual sectors, set out over the long-term, and communicated clearly to the public, are important to ensure buy-in and providing a stable investment environment*." Despite such warnings, we have seen the government's recent changes to its timelines for for the phasing out gas boilers,[60] and the scrapping of the Energy Efficiency Taskforce, set up by the Chancellor, after just 6 months in operation[61].

- **Unfamiliar technologies are usually adopted more slowly when they are perceived as complex**, and are adopted more rapidly when consumers can experiment with them before purchase (trialability) or can see them being used by others (observability).[62]

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[58] UK final greenhouse gas emissions statistics, BEIS, 2020
[59] Independent Review of Net Zero - GOV.UK
[60] On this change, the Committee on Climate Change (CCC) have stated that "*On decarbonising buildings, the announced changes will make it more difficult to meet the government's sectoral pathway. While a 2035 phase-out date for fossil boilers is potentially compatible with Net Zero, the exemption of 20% of households from the phase-out will have an impact on emissions all the way out to 2050 – making Net Zero considerably harder to achieve. Most importantly, it creates widespread uncertainty for consumers and supply chains. Although the grant for heat pumps was increased from £5,000 to £7,500 it has not been accompanied by a larger budget and will, therefore, serve fewer homes.*" *CCC assessment of recent announcements and developments on Net Zero*, CCC 12 October 2023
[61] Rishi Sunak scraps home energy efficiency taskforce - BBC News 23 September 2023
[62] Rogers, 2003

★ It is very difficult to imagine how a new technology may work, therefore demonstrator projects and sharing experience is key in helping potential community building owners with their awareness and decision making.

★ Public uncertainty about technologies for low-carbon heating and energy efficiency could be improved by carrying out retrofits and installations in public buildings, showcasing unfamiliar technologies and local installers, and demonstrating costs and savings[63].

★ Community groups are uniquely placed to offer trusted impartial advice to win the hearts and minds of a community, through promoting awareness of climate change and the contribution community buildings can make in reducing carbon emissions.

Experience

- Over the past few years, the model for community owned generation - solar PV in particular - has become well established. Whilst the number of projects have reduced dramatically following the sudden removal of the Feed In Tariff (FIT) in 2019 (an example of the 'stop-start' nature of government policy), practical subsidy-free models for solar projects have slowly been developed over the past few years by community energy groups, and are now accelerating as a result of the much higher wholesale prices for electricity being faced by consumers.

- **There is however no equivalent model for community owned renewable heat - heat pumps in particular - combined with energy efficiency improvements.** This report will list multiple barriers as to why this is the case (along with suggested solutions in green boxes), but the fact is that today there are very few community groups that have the experience or expertise to deliver a renewable heat project.

- There are few examples of successful heat projects in non-domestic buildings (by anyone, not just community groups) to help inform new ones. Likewise, very little in terms of guidance. Not many community energy groups have the resource or expertise to deliver such complicated projects in a new field such as this. Skills in areas such as building physics, engineering, technical review and multi-level procurement may not be commonplace in groups, along with complex project and stakeholder management skills.

[63] Behaviour change, public engagement and Net Zero - Imperial College London, 2019

★ Over the last decade, community energy groups have gained considerable experience in developing and delivering energy projects, and these groups have the potential to facilitate delivery of heat pump installations and manage projects that the community building owner itself cannot. Once groups have built up the necessary expertise, they can perform the role of a trusted intermediary to project manage, just like they have done for solar projects

★ Networking groups can provide the opportunity to share experience and knowledge, such as Octopus Community Network, Community Energy London and Community Energy England

Agency

Multiple Stakeholders

- Project Management
    - Community groups are used to managing a wide number of stakeholders when delivering projects such as rooftop solar: the building owner, users on site, planning departments, local council, etc. **but when it comes to a retrofit heating project, there needs to be a significant amount of project management and design that can't be delegated to the installer(s).**
    - A technical specialist is advisable to project manage the appointment of contractors and to supervise their delivery and compliance. Under PAS2035[64] guidelines this role is that of the retrofit coordinator (or "retrofit lead professional" under PAS2038 which is the equivalent standard for non-domestic buildings) one of five newly defined roles. **There are very few qualified retrofit coordinators around, in part because the role is so new.**
- Time
    - **Multiple stages of feasibility, scoping, business case compiling, board approvals, tendering, funding bids means that there is a high risk of volatility in the price of materials, equipment and labour**. At the time of writing, UK inflation as measured by the Consumer Prices Index (CPI) rose by 10.1% in the 12 months to March 2023, some of the

[64] "PAS 2035 is the overarching document in the retrofit standards framework. It was introduced following the recommendations of the Each Home Counts review. It details how to carry out quality energy retrofits of existing domestic buildings, alongside best practice guidance for implementing energy efficiency measures", Elmhurst Energy

highest rates observed in over 40 years[65], combined with severe supply chain issues brought about by the war in Ukraine, BREXIT and the post Covid-19 pandemic this causes problems should prices increase beyond project budget.

- Certain investment decisions will only be granted subject to pay-back within a specified timeline, often linked to land or building lease timelines.
- Site managers will need to be able to set aside time for meetings and arrange access - this could be a problem with continued use (access).

- Consultation
  - For community buildings in particular, the users of the space must be consulted; after all, it is a building designed for them. Consultation must be undertaken to canvas users' views on adopting a low carbon technology, on the resultant impact to the look and feel of the building, and of course on any associated costs - or savings - that may be passed on.
- Capacity
  - The time and resources needed from the community building staff is not insignificant. Those responsible for facilities often have many responsibilities beyond energy efficiency, and it takes time to perform (and potentially train up for) the role needed as liaison for such a retrofit project.

Decision Making

- Inertia
  - **The decision-making processes for the adoption of a new renewable heating system is complex.** Most organisations will have repair and maintenance schedules, policies and timelines already mapped out. For example, “end of life policies” for equipment that mean it can only be replaced when it reaches the end of its useful life[66]. Attempting to pre-empt this stage will require a strong argument for change. There is an incredible amount of inertia when it comes to deciding on a new approach. Site managers for buildings owned by local councils for instance may be very cautious.
- Complex decision chains

[65] Consumer price inflation, UK: March 2023 ONS

[66] Building Energy Efficiency Survey (BEES), 2014-2015: Overarching report, BEIS, 2016

    - Either internal or externally enforced burdensome approval chains create inefficiencies in action.
    - Community sites sometimes require multiple layers of consent and those involved may need to be introduced to the costs, operation and benefits (and limitations) of ASHPs before making a decision.
    - Another behavioural barrier is imperfect evaluation criteria, which can result in inaction or incorrect action being taken.

- Key motivation
    - An essential element in the decision-making needs to be established first: what is/are the key driver(s) for changing the existing system? Cost as a key driver will have a rather different business case than carbon.
    - Landlords may have a different set of value-drivers than tenants, which in turn may be different from the users of the space. There may be requirements set by central funding bodies which don't align to the aspirations of other parties. Essentially: what is the incentive for each to invest in energy efficiency improvements?
    - The up-front cost barrier is exacerbated by the tendency (so-called 'hyperbolic discounting') to focus on immediate or near-term costs and put less value on longer-term savings and benefits[67].

- Priority
    - Other more pressing refurbishment work often takes precedence over low carbon heat or energy efficiency improvements, especially if these would disrupt business as usual activities. The low status of energy efficiency work and divergent interests contribute to these organisational barriers.

★ Find an internal champion who is keen to drive the decarbonisation agenda, and one that can secure buy-in from key decision makers quickly, check if they have existing sustainability policies in place as an organisation which might help provide the motivation for the project

★ Consulting with the community and other stakeholders - introduce them to the benefits of the technology

[67] Behaviour change, public engagement and Net Zero - Imperial College London, 2019

★ Run regular events prior to designing the new system to gauge opinion from users and collect feedback. Ensure buy-in and alignment on the journey

★ Use display panels, infographics, posters, social media blasts to promote the associated carbon/energy/financial savings; the average temperature achieved throughout the coldest (and warmest) months

★ Take users to an existing site (preferably nearby - similar type of building) with an ASHP already in operation

Planning Permission

- The government's Planning Portal states: "***The installation of air source heat pumps on non-domestic land is likely to require an application for planning permission to the local authority***. *You may wish to discuss with the Local Planning Authority for your area whether all of the limits and conditions will be met*"

- What is and isn't permitted development is set out in the *Town and Country Planning (General Permitted Development) (England) Order 2015 (as amended)*, from which **it appears that there is no permitted development for ASHPs on non-domestic buildings** - this means decisions will be made by individual planning departments upon application, which could result in more rejections due to the unfamiliar nature of ASHPs

- For context, and to ensure best chances for planning approval, the following rules apply to qualify as permitted development for domestic properties:[68]
    - All parts of the ASHP must be at least one metre from the property boundary
    - Installations on pitched roofs are not permitted development
    - Permitted development rights do not apply to listed buildings or scheduled monuments
    - On land within a Conservation Area or World Heritage Site, the ASHP must not be installed on a wall or roof which fronts a highway
    - On land not within a Conservation Area or World Heritage Site, the ASHP must not be installed on a wall if that wall fronts a highway and any part of that wall is above the level of the ground storey
    - The heat pump must be used solely for heating purposes
    - It must be removed as soon as reasonably practicable when it is no longer needed
    - It must be sited, as far as is practicable, to minimise its effect on the external appearance of the building and the amenity of the area

[68] Planning Portal

- Planning policy is not always clear and consistent from borough to borough, which doesn't help. Local planning policy may contradict the London Plan[69], additionally these policies may not work in harmony with those of other departments within the local authority. Some planning departments may not have come across heat pump technology yet, and as such may apply incorrect requirements

- Energy UK''s report "Energising the Heat Pump Market"[70], highlights that "*the requirement that air source heat pumps are not installed within one metre of a neighbouring property is an out of date policy that does not account for the fact that air source heat pumps are increasingly quiet to run, with the noise that they produce typically being easily drowned out by a nearby conversation*"

- Whilst the GLA's Energy Assessment Guidance is very useful for new build and major refurbishments in terms of what is expected in planning applications:
    - "*Where heat pumps are proposed, a high specification of energy efficiency will be expected to ensure the system operates efficiently and to reduce peak electricity demand*[71]"

    - ...the guidance is then deferred to local planning for smaller refurbishments: "*for non-referable applications, applicants should liaise with the respective borough on any local requirements for existing buildings in relation to demonstrating CO_2 emission performance*", which could result in differing requirements when seeking approval for an ASHP.

- For ASHPs, many of the permitted development guidelines may constrain their potential in London. The two primary issues are the noise and the aesthetic impact of the external fan unit, both of which are challenging in an urban environment with limited space

- **Whilst most London Councils have now declared a Climate Emergency, there is a lag in developing the associated policy and procedure changes within departments to facilitate low carbon retrofit in buildings**

★ Some London planning authorities have published Supplementary Planning Documents and Guidance, which may help with specific guidance for heat pumps eg. City of Westminster New Supplementary

[69] The London Plan 2021
[70] https://www.energy-uk.org.uk/wp-content/uploads/2023/03/Energising-the-heat-pump-market-report-March-2023-v2.pdf
[71] GLA, Energy Assessment Guidance, 2022

Planning Documents (SPD) | Westminster City Council and Planning householder retrofit how-to guides | Westminster City Council

★ Check local authority planning websites for previous applications and details of any issues.

★ Consider a pre-planning application which may provide an opportunity to talk to the Local Planning Authority about the application.

★ Planning issues will only generally arise with insufficient space on site (GSHP are more favoured by planners as the bulk of the infrastructure is below ground).

★ Encourage inter-departmental communication/alignment within Local Authorities through lobbying and support from community energy groups.

★ Central government has recently closed a consultation (March 2023) on changes to the National Planning Policy Framework (NPPF) which propose new guidance that: *"...significant weight should be given to the need to support energy efficiency improvements through the adaptation of existing buildings, particularly large non-domestic buildings, to improve their energy performance..."*[72] reflecting that there is still change in policy underway.

Technical

Fabric First

- **Buildings that are well-insulated, air-tight and with appropriate ventilation will be most suited to a low temperature heating system such as a heat pump.**

- Whilst an ASHP can be used for space heating in almost any building, energy-inefficient buildings require a heat pump with a high flow temperature to offset the thermal losses from the building fabric, which can make the heat pump less efficient and more costly to run than if fabric improvements were made first.

[72] Levelling-up and Regeneration Bill: reforms to national planning policy, DHLUC, December 2022

- Some higher heat losses can be overcome with larger radiators/greater quantities of underfloor heating and this will reduce the flow temperature to maintain a good efficiency, however it does not reduce demand.

- It should be noted that a holistic approach to understanding a building's physics is essential to avoid unintended consequences of retrofit, specifically when changing the fabric. For example, whilst sealing up draughts may help with insulation, it could result in unwanted moisture and resultant issues caused by dampness.

★ Where space heating targets are unachievable an interim step may be to use a hybrid heat pump[73] while fabric improvement works are undertaken

★ Well insulated buildings will allow for a smaller heat pump and therefore lower capital costs and ongoing operational costs, as well as delivering a lower carbon building

★ Consider any repair or maintenance programmes before undertaking work to ensure correct sequencing and no regret spend

★ It may be possible for well-insulated buildings to "coast" over peak demand periods, which could reduce operational costs when using time of use tariffs

Supply Chain

- Trust
    - With any major works to a building, it is essential that the contractor can be trusted to perform works to a high standard following the schedule and specifications agreed in a contract, and remedying substandard work where identified.
    - Knowing where to start to identify the right professionals for the work required is challenging, especially at the feasibility stage when considering who to conduct an assessment of the heat demand - an independent consultant to avoid up-selling, or an installer who can do both? Should design be separate from installation?

[73] A hybrid heat pump is a heating system that combines an air source heat pump with a gas or oil boiler. The oil or gas boiler is used to 'top-up' a low temperature heat pump to meet the heating demands of the property where the heat pump cannot do it alone, The Heating Hub.

- There are no “trust a trade” websites for non-domestic heat pump installers, and general tradespeople may not yet have sufficient training or expertise in this emerging technology.
- A huge barrier is not knowing who to turn to and trust when there is so much inconsistent advice from a poorly developed supply chain. In addition, it is challenging to critically assess the work of a consultancy without in house expertise.
- The customer journey is challenging for the various elements of a renewable heat retrofit project: the choice often appears to be between (expensive) professionals or contractors lacking an overview or understanding of the end goal. According to the last count of MCS certified heat pump installers – which totalled 1,500 compared to 135,000 trained gas engineers – the UK is still 28,500 installers short[74].

- Standards
  - The MCS (The Microgeneration Certification Scheme Service Company) initially set up by the government, is now a wholly owned subsidiary of MCS Charitable Foundation. MCS has become the recognised Standard for UK products and their installation in the small-scale renewables sector.
  - MCS accreditation is not a legal requirement for installers undertaking renewable installations, although consumers will sometimes require a certificate if they are applying for financial funding through an incentive scheme.
  - It should be noted that MCS focusses on domestic and small commercial sized installations. There is far less information available for larger installers, and little incentive for them to achieve the MCS certification as it is often not part of requirements.
  - Issues may also arise when subcontracting work that may not be completed by a certified contractor.
  - TrustMark says it “*delivers consumer confidence through its network of Scheme Providers who commit to ensuring their registered businesses maintain required standards of technical competence, customer service and trading practice*”, there have been reports from CEL members that action has been inadequate upon receiving a complaint. Also worth noting that contracting with a Trustmark registered contractor is not a guarantee of workmanship.

[74] Campaign launches to address UK’s gaping heat pump skills gap - Current News

- The government's Each Home Counts[75] review recommended MCS and Trustmark work together to deliver a "quality mark", part of the quality and standards framework planned through the review.
- There are very few Trustmark approved installers, and again, this is directed towards the consumer market, rather than commercial.

Each Home Counts programme for domestic energy standards, which was set up in 2016 by MHCLG and DECC (now part of ESNZ). Also known as the Bonfield Review (lead by Peter Bonfield of BRE), the Each Home Counts approach was a response to the poor quality of delivery of energy efficiency retrofits under previous schemes (including the Green Deal) and included several recommendations such as a new standard and a supporting certification system established by TrustMark.

This resulted in the establishment of the Retrofit Standards Task Group (RSTG), which defined a need for a cohesive standard with a holistic approach. In conjunction with this work, the RSTG announced the development of a new technical committee to examine additional related standards (including building performance evaluation, energy assessment, air tightness and ventilation and energy advice).

The standard was initially published as PAS 2030/2035 in 2019. Early versions of PAS 2030 included cursory coverage of non-domestic structures, but with the publication of PAS 2035, it was apparent that non-domestic existing buildings required their own standard. This resulted in the development of PAS 2038.

Figure 8: The PAS2038 standard[76]

- Certification
  - Display Energy Certificate (DEC)
    - A DEC and advisory report are required for buildings occupied by a public authority where the total useful floor area of the building exceeds 250m^2 and which is frequently visited by the public.
    - For buildings over 1,000m^2 (large community buildings) they are valid for 10 years, which makes them less effective as a tool for advocating a change in energy efficiency. Buildings between 250-1,000m^2 (medium community buildings) are valid for 1 year.
    - There are concerns that installing an ASHP won't improve the DEC score, which does not help the business case.

[75] Each Home Counts BEIS 2016
[76] PAS 2038:2021 Retrofitting non-domestic buildings for improved energy efficiency

- Energy Performance Certificate (EPC)
    - Unless exempt[77] for example, places of worship, a community building will need to have an Energy Performance Certificate (EPC) if it is being let (or built, or sold).
    - Minimum Energy Efficiency Standards (MEES). From 1 April 2018, landlords of privately rented property (both domestic and non domestic property) in England or Wales must ensure that their properties reach at least an EPC rating of E before granting a new tenancy to new or existing tenants, and from 1 April 2023: even where there has been no change in tenancy arrangements.
    - Whilst the 2020 Energy white paper confirmed that the future trajectory for the non-domestic MEES will be EPC B by 2030, there are still issues with implementation and enforcement of the existing standards.
    - **EPC assessments use many broad assumptions and cannot be relied upon for an accurate assessment of a building's needs. And unlike DECs, there is also no requirement for mandatory building performance evaluation and monitoring.**
    - EPC is based on a cost-based metric, the cost of fuel (for heat, light and water) for each square metre of floor area of the home, this will not help reduce carbon emissions when the cheaper fuels have higher carbon emissions (gas). Both fuel prices and carbon intensity figures used for gas and electricity are also out of date and do not take account of the significant decarbonisation of grid electricity - hence why heat pumps are often not recommended[78].
        - **There is an urgent need for the government to expedite progress on its EPC Action Plan[79]**, by working with industry and consumer groups.
        - **A letter outlining the need for reform of domestic EPC rating metrics to support delivery of Net Zero** has recently been sent from Lord Deben, Chair of the Climate Change Committee, to Patrick Harvie MSP, Minister for Zero Carbon Buildings, Active Travel and Tenants' Rights[80].

[77] Energy Performance Certificates for your business premises: Exemptions - GOV.UK
[78] Why does my EPC not recommend a heat pump? - Elmhurst Energy
[79] Improving Energy Performance Certificates: action plan - progress report - GOV.UK
[80] Letter: Reform of domestic EPC rating metrics to Patrick Harvie MSP - Climate Change Committee

- Incentive
    - Construction firms are busy, and many are unwilling to invest in new skills and accreditations without the confidence that demand for retrofit will create a future market[81] NESTA recommends incentives from government to help train heat pump engineers through apprenticeships or college courses in its recently published "How to scale a highly skilled heat pump industry"[82].
    - Getting contractors to provide timely (and accurate) quotes to align to funding rounds is difficult due to the long-winded nature of retrofit projects, and the dynamic market conditions.
    - Individual (small) projects are not worth it for many contractors.
    - Unlike the Boiler Upgrade Scheme (BUS) for domestic properties[83], there is no equivalent support scheme to incentivise non-domestic heat pump instals – apart from public sector buildings which are supported through the Public Sector Decarbonisation Scheme (PSDS)[84]. Buildings that fall out of this sector (such as those considered in this report) cannot access any support from the government.

★ Talk to other community groups about which contractors they have used, share information on the Community Energy London Suppliers & Contractors database.

★ Look for Trustmark accreditation or look up contractors on the Trustmark database, talk to established retrofit organisations about potentially using some of their recommended suppliers.

★ MCS provides a directory of installers and companies qualified to fit heat pumps under MCS: Find a Contractor - MCS.

★ The Federation of Master Builders also has a directory of recommended builders: Energy efficiency and retrofit | FMB, Federation of Master Builders.

★ MCS and the Institute for Apprenticeships and Technical Education (IfATE) has co-developed the Low-Carbon Heating Technician apprenticeship with input from several of the UK's largest heat pump installation firms, with colleges able to claim £22k in funding for each apprentice taken on (Sep'23).

[81] Green skills and warmer homes: where can councils make a difference?, Ashden, 2021
[82] How to scale a highly skilled heat pump industry | Nesta
[83] Apply for the Boiler Upgrade Scheme: Overview - GOV.UK
[84] See Appendix 4

- ★ Energy companies like Octopus are investing in R&D and training centres for new heat pump engineers.
- ★ Use the "Heat Pump Talk" guide for installers and consumers Energy specialist launches 'Heat pump talk' guide for installers.
- ★ Engage with local trades and form a relationship for repeat work. Talk to people active in the sector and get to know the players, build networks - all are very keen to share knowledge openly.
- ★ Use a hybrid approach whereby a survey + heat calculations are carried out by the community organisation, leaving a more straightforward proposition for installers (and less travel).
- ★ Check Trustpilot and Google review ratings.
- ★ Develop a pipeline of projects, or a portfolio that can be tendered.
- ★ Refer to independent publications by volunteer groups like LETI, for instance the Climate Emergency Retrofit Guide | LETI.
- ★ Getting several quotes is recommended, and means you can assess level of trust at that stage.

Design

- Heat pumps are not a like-for-like replacement for gas boilers or conventional electric heating and good practice system design is essential[85].
- Unlike buying electricity, there is no price comparison website for heat pumps, and with such a range of options it is often hard to appreciate which to choose. Heat pump installers will recommend certain models, but community groups will need technical expertise to review the recommendations to make sure they are suitable for the building.
- It is also hard to identify an appropriate organisation to conduct a feasibility study for an ASHP, consideration should be taken as to conflicts of interest and potential over-design.
- There are often cases of poorly designed heat pump systems causing additional running costs and negative impacts on comfort cropping up in the media, this has tarnished the reputation but can be avoided with appropriate consideration.

[85] Carbon Trust - *Heat pump Retrofit in London*, GLA 2021

- It should be noted that a lot of gas boiler systems have not been designed, installed and run correctly for many years now.
- Performance - where standard manufacturer details are used, without considering the proposed system requirements or occupant usage, the reported carbon emission saving is likely to be optimistic and incorrect[86].
- When is it advisable to seek a second opinion? How and when should recommendations from a feasibility study be validated?
- Some design considerations:
    - A target for space heating demand of 65 kWhr/m^2/yr is a good level to aim for[87]. Figure 0.1 below gives an indication of a target range for domestic properties to aim for[88].
    - What is the efficiency of the existing boiler being replaced?
    - Can the existing heat emitters (eg. radiators) be used or will they need upgrading?
    - Heat pump efficiency decreases with an increasing difference between environment and output temperature.
    - HP sizing - under-sized pumps will not be able to cope, oversized will cost more for no additional benefit.
    - What level of detail is needed from the installer - if items are not specified in detail there is scope for price increases.
    - Low temperature heating systems have multiple health benefits, especially air quality which can help with those prone to breathing issues such as asthma.

[86] Energy Assessment Guidance, GLA, June 2022
[87] London Councils Retrofit Action Plan aimed for a 'sweet spot' in terms of a space heating demand of 65 kWhr/m^2.yr on average as a way of optimising risk and cost
[88] Climate Emergency Retrofit Guide | LETI

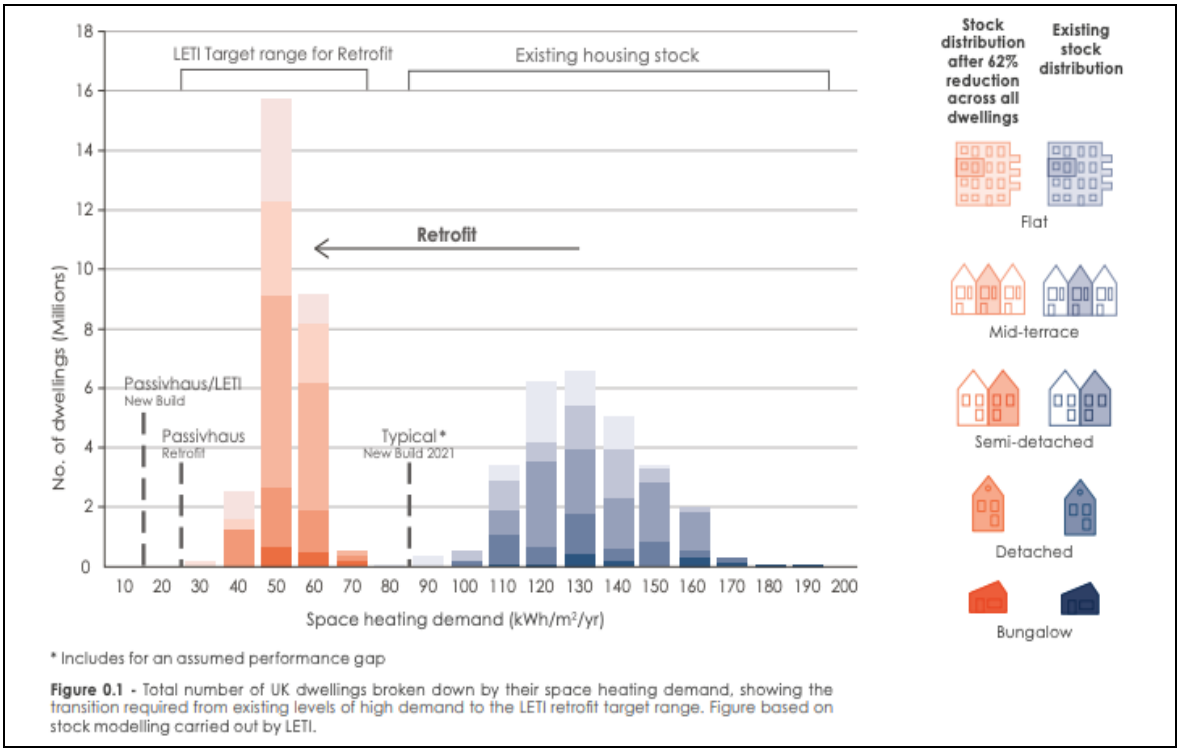

Figure 9: Total UK dwellings by space heating demand[89]

- ★ Hybrid heat pumps (HHP) combine a heat pump with an existing gas boiler. The heat pump will meet baseload demand at a high efficiency, whilst the gas boiler will only trigger to meet peak demand at times when the heat pump can't. This can allow clients to retain existing radiator systems and just retrofit the existing boiler, once fabric improvements have been made, the gas boiler can be removed.
- ★ Smart HHP systems can shift electricity loads to off-peak by preheating the building or using other thermal storage such as water tanks, cheaper than utilising battery storage. Flexibility of heat demand can bring energy saving and financial benefits.
- ★ High temperature (80℃) heat pumps may be an option to retain use of existing emitters, or because of poor building fabric, although more expensive up front and lower efficiency than low temperature systems.
- ★ Developing in house assessment and design skills may remove the need to engage a separate consultant to produce a survey and heat calculations.

[89] Source: LETI Climate Emergency Retrofit Guide, 2021

★ Scope and accountability - understand exactly what is required from each contractor in order to meet expectations and avoid unnecessary spend. For example, who is responsible for heat loss calculations (the amount of heat lost from a building through walls, windows, doors etc. over a given time period)?

Physical

Connection

- In some circumstances it may require a fuse upgrade from 30/60 to 80/100 amps, or a meter upgrade from single to three phase (>15kW, which may cost a little), but unless there is a significant change to load, the distribution network operator (DNO) will not require a study or additional charges[90].
- An additional meter may be required to monitor the electricity being used by the ASHP, and potentially even for the heat used if there is an agreement based on heat payments.

Sound and Visual

- For domestic properties, permitted development requires that air source heat pump installations comply with a maximum sound pressure level of 42dB(A) when assessed one metre away from the neighbours nearest window or door of a habitable room. In London, there is very little space between neighbouring sites, and so this could pose a real problem when identifying suitable locations for the ASHP, noting that similar noise level constraints will be expected for planning permission on a non-domestic property.
- Sound power is the total acoustic energy emitted by a sound source and is an absolute value, irrespective of the environment or location of the listener. You will typically find sound power ratings provided in heat pump specification documents from manufacturers. Sound power levels can range widely between 40 and 80dB(A) for different makes and model of heat pump.
- Sound pressure is what we hear. It is determined not just by the sound power of the source but also by the specific surroundings and the distance from the source to the point at which the sound is heard. For example, sound pressure increases with the number of reflecting surfaces but can be reduced by obstacles to the acoustic path. The 42dB limit applies to sound pressure.

[90] UKPN: Installing an electric heat pump | UK Power Networks
SSEN: Heat Pump - SSEN

There is a risk that a noise assessment may result in a reading that is outside planning requirements once in situ.

- It costs in to have a professional sound assessment carried out to establish whether planning requirements are met, and even more to remedy!
- ASHPs aren't particularly attractive and can be visually conspicuous when placed externally, and they need free flowing air so cannot be located in a plant room). In a community building it is important to consider the visual and noise impact on users of the building, and neighbours.

★ Using screening to reduce visual harm, or an acoustic cage to dampen noise levels, or even setting timers so that the ASHP doesn't operate during the night.

★ Premium heat pump models with very low levels of noise will enable far more choice in the positioning of heat pumps. Likewise, careful positioning away from inhabited rooms and reflecting surfaces can mean that relatively noisier heat pumps are still able to meet noise requirements.

★ Another option could be to extend the pipework and position the ASHP in a less visible location; there are also likely to be more attractive product designs in the future.

Space

- Heat pumps will typically require more space, both internally and externally than gas boilers or conventional electric heating - see Appendix 2 for types of ASHP. This is a key consideration for heat pump retrofit, particularly in London where internal space in dwellings is valued in excess of £6,000 per m^2[91] (nothing potentially less for community scale buildings).
- For air to water systems (rather than air to air), space is required for a large thermal store, although not necessarily taking up much more room than the previous cylinder (and space is saved where the boiler was indoors).
- The facility to store energy, most simply as heat in hot water cylinders, is also a crucial part of demand management strategies. Using cheap electricity to heat a tank of water that is then available to use during the day reduces the cost to the consumer and the carbon emissions of the energy.

[91] Rightmove (2020)

★ Heat batteries that store heat in a phase change material (rather than water) may take up less space.

★ Whilst this report focuses on the potential for ASHP, using a closed loop GSHP with boreholes (rather than trenches) could be an option. The boreholes are driven down vertically to around 100m, small in diameter (150mm), located within 25m of the building and virtually all the plant will be subterranean. Whilst upfront costs are more expensive, they are likely to take up less space.

★ For larger buildings, open loop systems which exchange heat with surface water sources or shallow aquifers in the ground can make for a very strong financial case due to the lower drilling costs and high efficiencies achievable. London has particularly good potential for both shallow aquifer and surface water sources[92]. Although they would require permits and usually require more maintenance.

Disruption

- Building work can be disruptive, sometimes requiring the premises to shut down for the duration of work. This is something that requires careful management, as it can also cause financial loss as well as inconvenience.
- Should additional work be required to the existing system of heat emitters (radiators, underfloor heating) and pipework, this can be substantial.

Financial

Business Model

- Unlike community owned solar PV, the benefits case for community based heat pump schemes on its own just doesn't stack up in a traditional way. A simple financial cost/benefit analysis would see payback taking decades based on energy savings alone.
- The multifaceted nature of the renewable heat system introduces a large amount of uncertainty, both in the performance and associated costs. This is a major barrier for community groups who, in most cases, won't be able to offer a return on investment to funders, nor potentially convince decision makers to go ahead with the investment.

[92] Heat pump retrofit in London | The Carbon Trust

- For leased properties, it is often a requirement of the business case that payback is achieved within the term of the lease - an issue exacerbated by short term or uncertain lease lengths.
- Volatile wholesale gas and electricity prices mean business modelling is very difficult unless price hedging is possible, which on the whole is not for community organisations.
- At present, green levies (which make up around 8% of total unit charges) are applied to electricity rather than gas, which adds to running costs of heat pumps compared to gas boilers. Government policy to reduce the long-term cost of electricity relative to gas remains crucial to the roll out of heat pumps.

★ Financial modelling alone of course is not the full picture. The benefits associated with installing renewable heating in a community building stretch way beyond a simple operational financial payback, such as: increased commercial value, compliance with future building standards or contributing to an organisation's carbon reduction target, more appealing environment to rent out/use more, education and knowledge sharing.

★ With the digitalisation and development of flexibility services within the energy market in the UK will come multiple opportunities to use smart technology to optimise the running of low carbon technology in buildings. Dynamic time of use tariffs, phase shifting of heat demand, smart charging, vehicle and battery to grid optimisation to name a few.

★ Particularly where deep retrofit occurs, this can off-set other planned maintenance expenditure and reduce emergency repair work to buildings. Likewise, where fabric or other upgrades are required anyway as part of a maintenance programme.

★ Combining the attractive returns of investments such as solar PV and LED lighting with retrofit can help with the business case.

★ Types of model without upfront cost:
  - Grant-funded - customer pays for heat pump with a grant from their local authority (many London boroughs have carbon offset funds)/ government (e.g. Boiler Upgrade Scheme (BUS) for <50kWe installations) / crowdsource.
  - Heat Contract - customer pays for heat, appliance and and O&M based on amount of heat used (kWh).

- Energy Services contract - fixed price for energy with cost savings achieved through measures being used to pay back capex (pay to save).
- Heat and comfort as a service - based on provision of heat at a given temperature and duration. Could include the cost of appliances and O&M.

Cost

- Almost certainly the key barrier to investment is the relative cost of a low carbon heating solution such as an ASHP compared to a traditional gas boiler. Although the government asserts that the mass uptake of heat pumps will see economies of scale result in cost parity against gas boilers, this is yet to materialise

- ASHP have higher up-front costs than replacement gas boilers or electric heating systems[93]. ASHP costs can vary significantly based on the specific details of the installation, availability of source heat, ancillary works required and the specific technology chosen. Heat pumps of the same type and size can still vary substantially in terms of efficiency, build quality, applications, features, brand, noise and aesthetics

- Equipment and installation costs can also include: other energy efficiency measures (these may be significant), buffer tanks, new heat emitters (radiators or underfloor heating), heating and smart controls, metering, costs associated with any changes to the electricity connection or a new distribution board, and thermal stores. There may also be a cost to disconnecting from the gas supply

- Larger heat pumps (measured by their kW input) are only slightly more expensive to install overall than smaller heat pumps. The variation in cost within heat pump size bands is quite large though, this suggests that most of the variation in upfront cost comes from the installation work

[93] Heat pump retrofit in London | The Carbon Trust

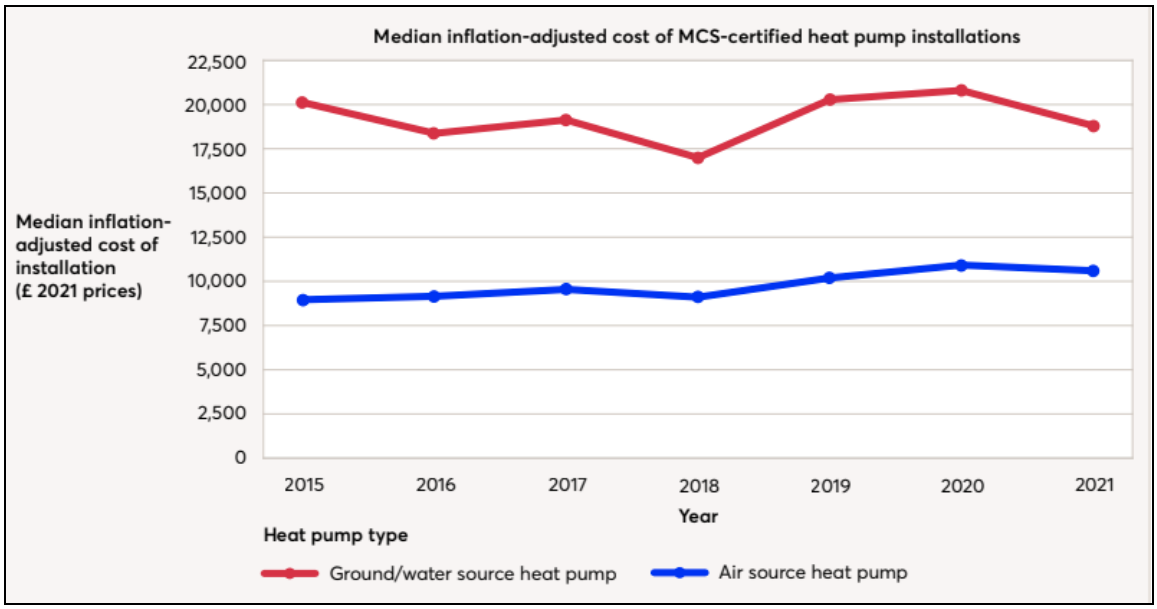

Figure 10: Indicative cost of heat pump installation over the last 7 years[94]

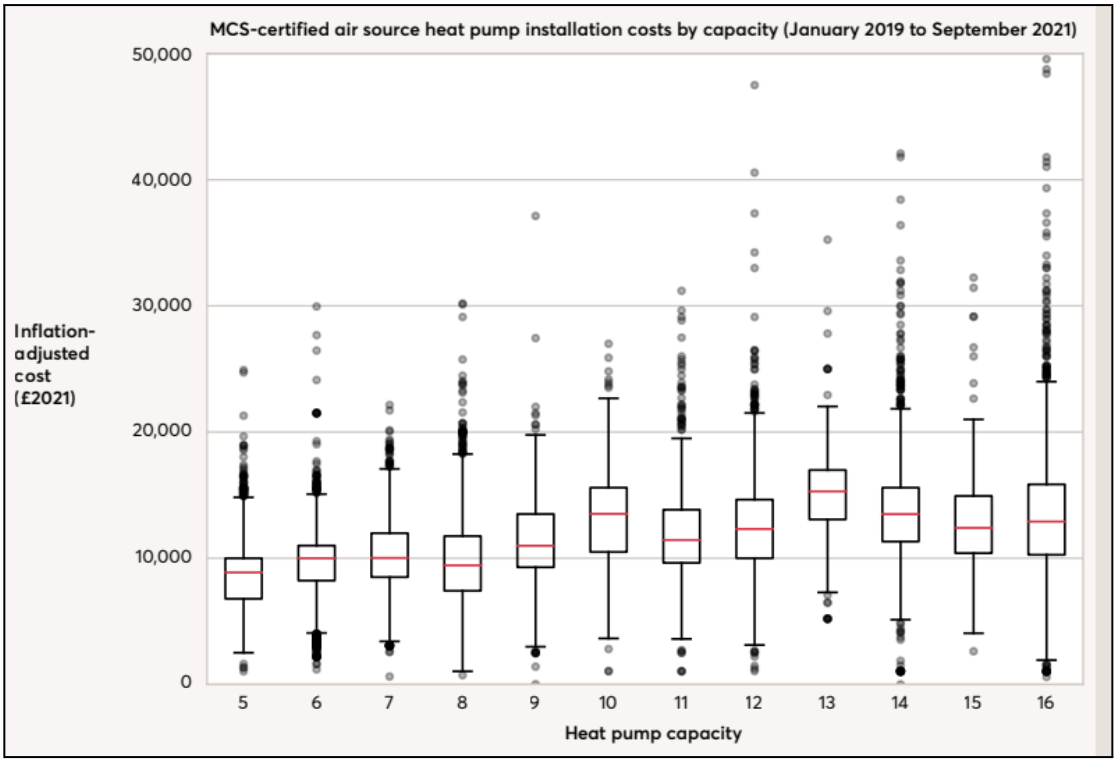

Figure 11: Indicative cost of heat pump installation by capacity[95]

[94] How to reduce the cost of Heat Pumps, NESTA, Feb 2022
[95] How to reduce the cost of Heat Pumps, NESTA, Feb 2022

- For projects where fabric improvements are considered prohibitively expensive, high temperature heat pumps may be specified (those designed to operate primarily between 55°C-80°C). These are likely to have higher up-front costs than standard temperature heat pumps, and will also cost more to run.
- A building's heat demand profile needs to be established. Certain use types could make it more or less suitable for an ASHP, but more importantly the level of heat loss will play an important role in determining the heat demand profile and therefore cost of running.
- Costs will be more when applying heritage sensitive measures to listed buildings or those in Conservation Areas.
- Hidden costs are a problem, for instance initial estimates once firmed up with site measurements and detailed design could spiral - if there is no contingency in the budget there will be a shortfall.
- Organisations of a smaller size may need to focus their funds on core activities limiting capital for energy efficiency measures. Hard to get funding outside of standard capital budgets - especially if energy budget is already stretched[96].

★ If a building has a poorly performing gas boiler, fuel bill savings could be achievable even without energy efficiency measures. For example, a 300% efficient heat pump would have the same fuel bills as a 65% efficient gas boiler under standard tariffs[97].

★ Review repair and maintenance budgets and plans, it may be that the retrofit work could form part of this. A simple cost uplift on this work could prove useful in making the business case, for example re-rendering a wall or building safety works is an ideal time to apply external insulation and would mean the actual extra costs are just the additional insulation material and labour to secure the insulation to the wall[98].

★ For air-to-air ASHPs, there is the potential to use electricity generated from a solar PV array for summer cooling, the generation profile from the solar will likely fit well with the air conditioning demand.

★ The lifetime financial case for heat pump retrofit is already strong in some building types, such as electrically heated buildings, buildings

[96] Building Energy Efficiency Survey, 2014-2015: Overarching report, BEIS, 2016
[97] Retrofit London Action Plan, London Councils, 2021
[98] Retrofit London Action Plan, London Councils, 2021

with a high cooling demand and buildings that already require major renovations. These building types should be prioritised for heat pump retrofit[99].

★ Roll out of smart meters will support OFGEM's introduction of a marketwide half-hourly settlement regime which would stimulate competition and innovation in time-of use tariffs and demand response services[100]. ASHPs combined with thermal storage could benefit from these tariffs through demand side response.

★ Gas price inflation of 97% under the price cap that changed in April 2022 was almost double that of electricity, such that heating an efficient home with a heat pump was [at that period] more than £220 cheaper per year than heating an average home with a gas boiler[101]. For non-domestic users the Energy Price Relief Scheme has set gas prices at £75/MWh and electricity at £211/MWh further closing the gap between electricity and gas prices.

★ Beyond the current support mechanisms for domestic and non-domestic energy bills, the government is considering moving environmental levies from electricity to gas, which further strengthens the case for electrification of heat[102].

Funders

- Many funds are either slow to embrace the pressing need for decarbonisation of heat projects, or they are focussing on fuel poverty alleviation for vulnerable customers more directly. There aren't typically funds from donors just to retrofit buildings by and large.
- Less and less funding opportunities available as money is scarce from trusts, foundations, donors etc. And with more demand coming from community organisations, it will be even harder to secure.
- In line with London Plan policies for new developments to be Net Zero in London[103], whilst some councils have secured carbon offset payments from developers, others have not so (for details see GLA Carbon Offset Funds Report 2020). The guidance[104] to how these funds are to be used focuses on

[99] Heat pump retrofit in London | The Carbon Trust
[100] Behaviour change, public engagement and Net Zero - Imperial College London, 2019
[101] Energy and Climate Intelligence Unit Inflation and the cost of running a net zero vs fossil fuel household
[102] Energy bills: getting the balance right
[103] See policies SI1 and SI2 of the *London Plan 2021*, GLA
[104] *Carbon Offset Guidance 2022*, GLA,

capital support as well as on projects that reduce carbon emissions, and hence provide a potentially useful route for funding community scale ASHP retrofits.

- Developing fair, customer friendly finance offers for heat pumps – whether through long-term repayment plans, green mortgages personal loans, heat-as-a-service offers or government-backed loans – should be a priority for financial institutions such as the UK Infrastructure Bank[105].
- Whilst a Community Share Offer can be a good way to raise funds, the amounts required can be significant and the payback uncertain.

★ The Mayor of London's London Community Energy Fund (LCEF) was used to fund various stages of the Caxton House project (windows, MVHR, BMS) and community energy group Power Up North London (PUNL) successfully applied for funding in the next LCEF round for the heat pump(s).

★ Some councils have released Community Energy Funds (eg. Islington, Hackney, Hounslow, Southwark, Lewisham)[106]. Community groups are encouraged to bid for grants to pay for feasibility studies and capital expenses for energy efficiency and renewable generation projects.

★ It is worth investigating opportunities for funding from corporates that have ESG targets who may be willing to finance low carbon solutions eg. BIFFA, UKPN, BA.

★ Apply for Co-Op UK's Standard Mark Booster Fund.

Grants and Subsidies

- Improving the energy efficiency of existing buildings, moving away from gas boilers and installing solar PVs to generate electricity are not sufficiently supported by the current regulatory framework. If London were to wait for a sufficiently ambitious national framework to be put in place, it is likely that a large portion of its carbon budget would be used[107].

[105] How to reduce the costs of heat pumps, NESTA, Feb 2022
[106] See *Setting Up a Local Authority Community Energy Fund*, January 2023, Community Energy London (CEL)
[107] Retrofit London Housing Action Plan, London Councils, July 2021

- With the closure of the Non Domestic Renewable Heat Incentive (ND RHI) in March 2021[108]) there is no longer any national government subsidy to incentivise heat pumps in larger buildings[109]. Less than 2000 heat pumps were installed under the ND RHI between Nov 2011 and Nov 2019[110]. The premature closure of the government's Urban Community Energy Fund (UCEF)[111] also impacted on the ability of London-based community energy groups to develop projects.

- The Boiler Upgrade Scheme (BUS)[112] (previously known as the "Clean Heat Grant") only applies to smaller buildings (<45kW capacity heat pumps), and whilst is better in terms of financing the upfront cost of heat pumps, it provides less financial support overall. There are also caveats requiring certain measures to be completed first eg. insulation, and will also not apply if a boiler is not being replaced.

- Zero rate VAT for equipment and installation of heat pumps is only available for residential buildings[113].

The Boiler Upgrade Scheme[114] (BUS) was launched by the government on 23 May 2022. The aim of the scheme is to encourage property owners to install low carbon heating systems such as heat pumps. Open to domestic and small non-domestic properties in England and Wales, it will run until 2025. The scheme offers grants of £7,500 off the cost and installation of an air/ground source heat pump. A grant for biomass boilers is available for certain rural properties. The grants in the scheme are not available for social housing, most build properties or properties that have already had government funding or support for a heat pump or biomass boiler. Also, the property must have an EPC with no outstanding recommendations for loft or cavity wall insulation.

In recognition of the higher upfront cost of low carbon heating systems such as heat pumps, the grants offered by this scheme are expected to incentivise faster uptake and drive down future costs through economies of scale and supply chain development - focusing in particular on the domestic sector. The limitation on the capacity of systems that can be supported through the team - up to 45kWth - means that it is unlikely to be suitable for many community scale projects, although it could be beneficial for smaller-scale community projects.

[108] See Ofgem for further details Non-Domestic Renewable Heat Incentive (RHI) | Ofgem
[109] RHI reforms 'successful in stimulating the adoption of renewable heat tech', says new report - Current News
[110] Element Energy, Heat street data, 2021
[111] Urban Community Energy Fund - GOV.UK
[112] Apply for the Boiler Upgrade Scheme: Overview - GOV.UK
[113] Energy-saving materials and heating equipment (VAT Notice 708/6) - GOV.UK
[114] Apply for the Boiler Upgrade Scheme: Overview - GOV.UK

Disappointingly, the findings by the House of Lords Environment and Climate Change Committee in February 2023 found the scheme is failing to deliver[115]

On 21st September 2023 a change notice was issued that increased the level of grant available for ASHP from £5,000 to £7,500 and for GSHP from £6,000 to £7,500. Whilst on the face of it encouraging, it should be noted that the total scheme funding and end date remains unchanged. In its first year, only 10,000 grants have been paid.

Figure 12: The Boiler Upgrade Scheme (BUS)

- ★ BUS could be available for a smaller community scale building, check criteria!
- ★ Public Sector Decarbonisation Scheme (PSDS) is for public sector buildings. Finance may be available through Salix Finance: https://www.salixfinance.co.uk/.
- ★ In August 2023 the government announced a Community Energy Fund[116] to launch in the autumn of 2023, a "£10m pot to support projects that will generate clean energy, such as rural heat networks or rooftop solar", as yet it is unclear whether ASHP projects would be eligible.

[115] The Boiler Upgrade Scheme is failing to deliver, says Lords committee
[116] Communities at the heart of new fund to boost local growth and energy security - GOV.UK

Conclusions and Recommendations

Decarbonising heat supply in buildings remains one of most significant challenges to achieving the UK's Net Zero target. The Government has set out that the key route to securing the 'decarbonisation of heat' is through the 'electrification of heat' and significant efforts are now underway to boost the heat pump sector through an increasing range of initiatives.

Government support for heat pumps has, however, almost exclusively been targeted at the domestic sector. Some limited programmes are in place for heat pump installations in non-domestic buildings, through the Public Sector Decarbonisation Scheme, and when heat pumps are to be connected to heat networks (through the Green Heat Network Fund) but there is no replacement support scheme to the Non Domestic RHI - which closed in March 2021 and no support for the installation of larger heat pumps.

This study has looked exclusively at the opportunities to retrofit ASHPs in London's community buildings sector, as these buildings are typically those most of interest to community energy groups. We have found that:

- **There is a very significant opportunity for heat pump retrofit in London's community buildings.** We have identified around 14,000 community buildings in this study - but other CEL analysis has estimated over 20,000 buildings depending on the range of community building categories considered[117]. These buildings are 'not going anywhere'. They are not only likely to be in place in 2030 (the target date for the Mayor's Net Zero target) but still here in 2050 (the current Government target date for Net Zero). We also note from using Energy Performance Certificate (EPC) data from the GLA's London Building Stock Model, it is clear that *all* of these buildings will need to be retrofitted in order to support the achievement of London's Net Zero ambition.

- **There are few other options to decarbonise heat supplies to these buildings in London.** Whilst there are a number of other potential technology options to decarbonise heat in buildings, many of these have major limiting factors as a result of London's dense built environment.

- **Community energy groups will have an active interest in working to help support the decarbonisation of heat in these buildings.** Community buildings ranging from community centres, to places of worship to arts venues form the basis for the majority of London community energy group projects such as LED instals, solar PV arrays to energy efficiency retrofits.

Based on the analysis we have undertaken in this study, and real world experience of groups progressing ASHP projects, we make the following

[117] See *Vision for Community Energy in London*, CEL, March 2023

recommendations to Central Government, Local Authorities and to community groups:

Recommendations

Central Government

- **Funding -** Introduce routes to financially support heat pump retrofit in community buildings. Options include:
    - Extending the Boiler Upgrade Scheme (BUS) to cover community scale boiler replacement (eg. up to 100kW capacity, or multiple smaller units)
    - Include funding for community-led heat pump retrofit within future rounds of the Public Sector Decarbonisation Scheme (PSDS)
    - Extend and expand the recently announced community energy fund[118] to provide additional support to developing heat pump projects
    - Provide a loan facility via the UK Investment Bank (UKIB) for community-led whole building retrofit
- **New policies -** introduce new place-based community led retrofit programmes. Local Area Energy Plans (LAEPs) are potentially a start for this, along with wider planning reform.
- **Unlock the potential -** realise the wealth of energy, expertise and capital within a community by designing retrofit funding programmes to encourage greater collaboration between councils and community groups.
- **Administration -** make it easier for community groups to apply for funds, from simpler criteria and processes, to streamlining the monitoring and evaluation reporting. Allow more time and provide funds in advance (community groups have little working capital).
- **Planning -** amend the National Planning Policy Framework (NPPF) to include ASHPs on non-domestic buildings within permitted development rights; and remove requirement for ASHPs to be >1m from the boundary.
- **Standards -** Energy Performance Certificates (EPCs) to move away from a cost-based metric towards carbon; non-domestic Minimum Energy Efficiency Standard (MEES) to be implemented and enforced properly.

Local Authorities

- **Awareness -** promote demonstrator projects and engagement initiatives in community buildings to provide confidence in heat pumps
- **Partnership -** procure the services of community groups to identify and

[118] *Communities at the heart of new fund to boost local growth and energy security*, DESNZ Press Release, 11 August 2023

develop ASHP retrofit projects

- **Planning -** strengthen and align Local Plans across authorities, ensuring supplementary planning documents support and fast track applications for heat pumps in community buildings
- **Funding -** utilise carbon offset funds[119] to establish local community energy funds to support community-led ASHP retrofit feasibility studies as well as capital works
- **Education -** develop knowledge and experience of ASHP retrofit across housing, planning, energy, environment teams

Community Groups

- **Skills & Knowledge -** upskill community group members in ASHP technology, heat calculations and fabric first retrofit
- **Share best practice -** between community energy groups across the country, arrange site visits, collaborate on projects
- **Partner with council -** form a close relationship with your local authority, offering valuable expertise in engagement and outreach
- **Finance -** recognise that the traditional business model used in solar PV is not transferable, and that decarbonising heat will require grants, subsidies and other external funding
- **Lobby -** help inform DESNZ on options for the scale of targeted subsidies / grants needed to accelerate the deployment of heat pumps in community scale buildings

[119] For background to this - see *Carbon Offset Funds Report 2021*, GLA, January 2023

Appendices

Please refer to a separate report which contains the appendices, available on the CEL website: APPENDICES: Retrofitting Heat Pumps In London's Community, Arts and Leisure Buildings

Appendix 1: Case Studies

- Case Study 1: Caxton House Community Centre - Power Up North London
- Case Study 2: Devas Youth Club - CREW Energy
- Case Study 3: One Stonegrove - Stonegrove Community Trust

Appendix 2: Types of Air Source Heat Pump

Appendix 3: Data Sets

Appendix 4: PSDS supported ASHP projects in London