Part Q:
District Heating Networks

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This part of the Development Requirements SPD provides further detailed guidance on the interpretation of the following Core Strategy policies, as appropriate:

- CS.2 Climate Change and Sustainable Construction
- CS.3 Sustainable Energy

https://www.stratford.gov.uk/corestrategy

This section of the SPD provides further information and guidance on the installation of and connection to district heating networks within development as required by Policies CS.2 and CS.3 in Stratford-on-Avon District Council's Core Strategy. It will be used by Stratford-on-Avon District Council to help reach decisions on whether to approve or refuse planning applications. Making sure that applications comply with the guidance contained within the SPD will make it easier for the Council to grant permission. The guidance in this SPD is also consistent with national planning policies in the NPPF.

Q1. What is district heating?

District heating (also known as heat networks) comprises a network of subterranean insulated pipes which distribute heating and/or cooling in the form of hot or chilled water from the local energy centre, such as a Water Source Heat Pump (WSHP) or a Combined Heat and Power (CHP), and deliver this directly to homes and businesses. This means that households and businesses do not need to generate their own heat or use centralised energy sources, such as individual gas boilers, as a primary heating source. District heating can reduce carbon emissions, improve air quality and benefit residents and businesses through cheaper heating and greater security of supply. When a district heating network incorporates CHP) it can also supply electricity at reduced cost.

District heating networks can connect to all buildings in areas where they are viable, irrespective of building size or type. They can supply existing and new buildings, ranging from residential dwellings to commercial offices, industrial sites and public buildings. A more diverse of mix of uses is preferable as this provides a diversity of heat demands at different times of the day and year, allowing for the energy centre to be sized to meet the baseload heat demand. This provides additional efficiency compared with individual gas boiler systems, as these are sized to meet peak demand and therefore operate below their rated efficiency.

District heating networks vary in size and length, sometimes delivering heat across a few hundred metres within a small housing development, or alternatively delivering heat across several kilometres to supply entire communities and employment areas. A district heating network can be easily extended by adding additional heat customers or heat sources as the scheme develops.

District heating networks are a well-established technology and widely used in European countries, such as Denmark and Germany, and are increasingly becoming widespread in the UK.

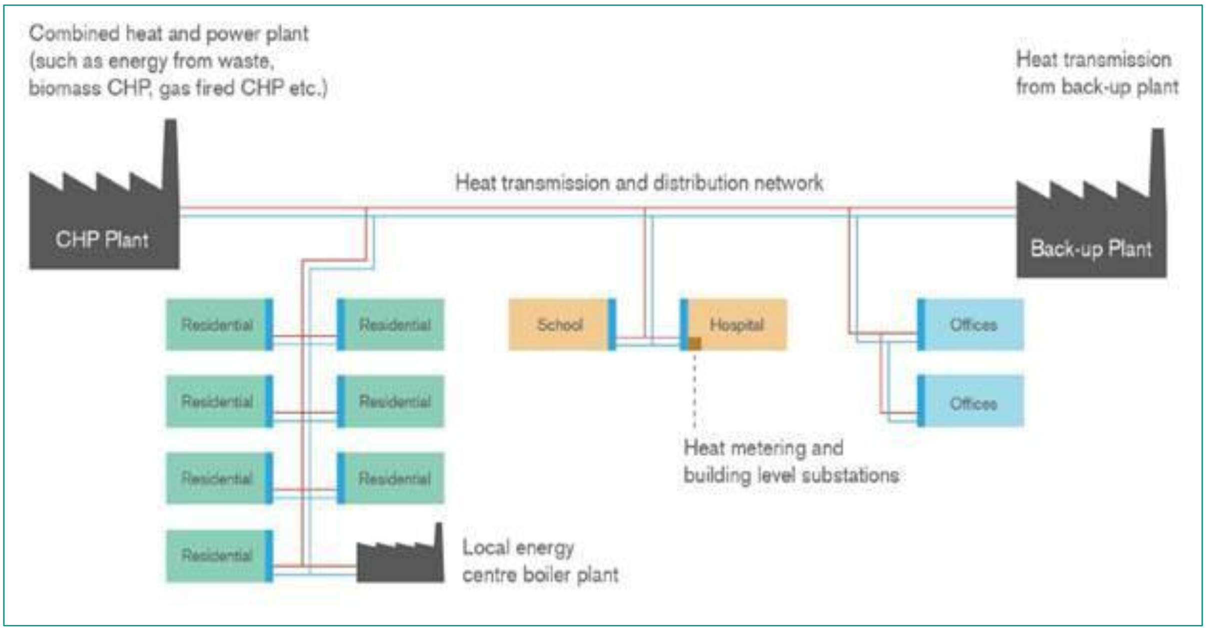

Fig. Q1 - An example of DH network (courtesy of GLA District Heating Manual for London).

A district heating system is made up of the 3 primary components:

- Generation: The energy centre comprises a central plant room which typically includes the primary heat generation equipment, back up and peaking plant, thermal storage and ancillary equipment such as pumps. The energy centre can be a standalone building of its own, or the equipment can be incorporated into the plant rooms of other buildings, depending on space availability. There are a wide range of heat sources that can be used, including; renewable heat technologies such as water and ground source heat pumps, solar thermal and biomass, waste heat recovery and Combined Heat and Power using fuels such as natural gas or biofuels. One of the key advantages of a heat network is that it is technology agnostic. This means that it can use a variety of fuels, including those which are available locally, and be optimised to allow for the integration of multiple generation sources at different stages during the life of the network. The heat generation plant typically has a lifetime of 15-20 years.
- Distribution: A network of subterranean pipes which distribute the heat. They range in size according to the scale of the scheme and the point in the network. Pipes can be steel or plastic, and are normally pre-insulated to a high level so heat losses are minimised. The pipework typically has a lifetime of 50-60 years.
- Retail: In order to supply the heat from the network to the connected buildings, there is a heat interface between the network and the heat consumer. This can be a building thermal substation supplying the whole building or individual heat interface units, similar in size to an individual gas boiler, supplying each dwelling.

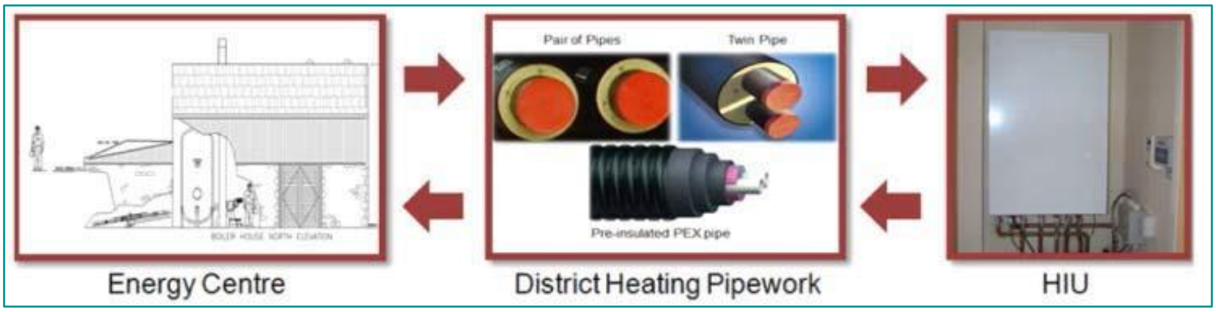

Fig. Q2 - Key component parts of district heating systems.

Q2. Benefits of connecting to district heating

The decarbonisation of our heat supply is identified as a crucial part of the country's transition to a thriving low carbon economy. The Government's heat strategy, '*The Future of Heating: A Strategic Framework for Low Carbon Heating in the UK* (DECC 2012) recognises the role of heat networks in contributing towards this outcome.[1] The Committee on Climate Change have projected that district heating networks could provide 20% of heat demand in the UK by 2050, compared to the current 2%.[2] In order to support this transition, the Department for Business Energy and Industrial Strategy (BEIS) recently launched the £320m Heat Networks Investment Project (HNIP), a capital investment programme which is expected to support up to 200 projects by 2021, and to leverage £2bn of wider investment.

District heating schemes offer a range of benefits compared to using conventional heating methods for consumers, building owners and developers. When they are well designed and operated, district heating schemes can offer clear advantages in total energy system efficiency and associated economic and carbon reduction benefits.

Benefits to developers

There are a number of potential benefits for developers connecting to a heat network:

- *Reduced capital costs* – the cost of network installation and plant is usually covered by the organisation developing the heat network – usually either a private Energy Saving Company (ESCo) or a local authority. This means that the developer doesn't have to bear the cost of installing heat generation plant for the site.
- *Reduced cost of compliance* - connection to a heat network can offer developers a more cost effective route to compliance with Building Regulations and Core Strategy Policies CS2 and CS3, and may even be the factor that enables developments to go ahead.

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[1] Department of Energy and Climate Change, The Future of Heating: Meeting the Challenge(March 2013) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/190149/16_04-DECC-The_Future_of_Heating_Accessible-10.pdf

[2] Committee on Climate Change, Next steps for UK heat policy, (October 2016) https://www.theccc.org.uk/wp-content/uploads/2016/10/Next-steps-for-UK-heat-policy-Committee-on-Climate-Change-October-2016.pdf

- *Space saving and design flexibility* – connection to a heat network removes the need for building level plant rooms and creates additional space which translates to increased development profitability. Where residential developments are proposed to use individual gas boilers, these are replaced by much smaller Heat Interface Units (HIUs). There is also no need to locate flues on outside walls, giving increased flexibility in terms of internal layout.
- *Reduced cost for local grid upgrades* - developers will normally have to negotiate a significant fee to be paid to the local distribution network operator e.g Western Power, in order to make sure the local grid can supply electricity needed at the development. This is particularly true where electric heating is proposed. Connection to a heat network can offer an alternative to electric heating and, where electricity and heat are generated, remove or reduce the payment due to the distribution network operator.
- *Increasing the attractiveness of development* - The development can be marketed with eco-credentials and lower lifetime operational costs. Evidence indicates that the total operational costs of heat networks can be lower than individual heating options, offering the potential for reduced heat costs and offset labour, maintenance and replacements costs.[3] Developers often need to pre-allocate space to commercial occupants. Increasingly, companies are seeking to push compliance with corporate environmental targets onto developers. A heat network should be able to offer a lower-carbon option, thus increasing the attractiveness of commercial space.
- *Long-term revenue generation opportunity* – increasingly, developers are choosing to invest in heat network infrastructure themselves, often in partnership with a private ESCo. This investment opportunity offers the potential for revenue generation for developers with a long-term interest in the site.

Benefits to heat consumers

There are a number of potential benefits for consumers who are connected to a heat network:

- *Energy cost reduction* - the ability to generate heat more efficiently means that district heating networks can provide heat at a lower cost compared with alternative solutions. This can contribute to reducing fuel poverty and helping consumers achieve affordable warmth.
- *Convenience* - consumers do not need to worry about the maintenance of heating plant or investment in replacement plant once it reaches the end of its life, as would be the case with individual boiler systems. This responsibility and cost sits with the network operator.
- *Reliability* - district heating networks are reliable infrastructure, and systems usually incorporate back up capacity to ensure that heat is always available.
- *Tenant comfort* - hot water district heating networks provide heating that is easily controlled, particularly when compared to older heating systems or electric heating.
- Carbon reduction - consumers connected to district heating networks can demonstrate a lower environmental impact through carbon reduction. This can be

[3] Department of Energy & Climate Change, Assessment of the Costs, Performance and Characteristics of UK Heat Networks, (2015). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/424254/heat_networks.pdf

an important factor for eco-conscious residential consumers or commercial consumers with corporate carbon targets.

Q3. Core Strategy Approach

Policy support for district heating schemes is set out in the Council's adopted Core Strategy Policies CS.2 'Climate Change and Sustainable Construction' and CS.3 'Sustainable Energy'. https://www.stratford.gov.uk/corestrategy

Within the identified district heating priority areas (see Section H6), the Core Strategy requires that new development should provide infrastructure for district heating, and will be expected to connect to an existing network, where and when this is available, unless it can be demonstrated that it would render the development unviable. Where it is demonstrated to the satisfaction of the District Council that it would not be viable to provide district heating infrastructure, then as a minimum, development will be required to include future-proofing measures, so that the site might be connected to a heat network at future date. This approach builds in resilience, allowing for easy adaptation to changes in technology.

Development proposals in all other areas will be encouraged to incorporate infrastructure for district heating, and will be expected to connect to any existing suitable systems (including systems that will be in place at the time of construction), unless it can be demonstrated that doing so would render the development unviable.

Policies for district heating

Policy CS.2 'Climate Change and Sustainable Construction' provides an overarching policy support for the promotion of decentralised and low carbon energy schemes, as one of the strategic measures to mitigate the impacts of climate change. In addition, Section B of the policy promotes the use of an energy hierarchy which encourages the achievement of carbon dioxide emissions reductions, and promotes both energy efficient and decentralised energy supply:

The Council will promote 'an energy hierarchy' in seeking to achieve carbon emissions reduction as follows;

1. Reduce energy demand through energy efficiency measures;
2. Supply energy efficiently, giving priority to decentralised energy supply; and
3. Provide energy from renewable or low carbon sources.

The aim of an energy hierarchy is to ensure that the selection of energy systems is prioritised towards the most sustainable energy sources.

Furthermore, the Council is committed to reducing fuel poverty, and whilst it recognises that energy savings can be achieved through Building Regulations, the Council considers that planning has a key role in achieving the fuel poverty reduction targets through the use of efficient decentralised and low carbon energy, and by ensuring that new development uses landform, layout and building orientation to minimise CO_2 emissions.

Policy CS.3 'Sustainable Energy' provides strong policy support for the implementation of district heating schemes, and outlines where a development is required to connect to an existing network, or where it is to be designed and futureproofed to connect to planned or future network.

Q4. District Heating Requirements

The development of low and zero carbon district heating schemes is strongly supported and encouraged. New development will be required to adhere to the policy requirements to connect to district heating or include future proofing measures unless it has been demonstrated that it is not feasible or viable to do so.

Developments which fall within the threshold criteria set out below, are required to connect to district heating networks where they exist, or incorporate the necessary infrastructure for connection to future networks, unless it can be clearly demonstrated that doing so is not feasible or that utilising a different energy supply would be more sustainable. Proposals for developments within the district heating priority areas, as defined by the Stratford-on-Avon Heat Mapping and Master Planning Study (HMMP) 2016 and District Heating Priority Areas Map, and all sufficiently large or intensive developments must demonstrate that heating and cooling technologies have been selected in accordance with the following heating and cooling hierarchy:

1. Connection to existing district heating networks;
2. Site wide renewable district heating networks,
3. Site wide gas-fired district heating networks;
4. Renewable communal heating;
5. Gas fired communal heating;
6. Individual dwelling renewable heating;
7. Individual dwelling heating, with the exception of electric heating.

Sufficiently large or intensive developments are defined as any of the following:

(a) residential only developments of at least 50 dwellings per hectare and/or at least 300 dwellings;

(b) residential only developments of 50 dwellings or more that are located near a significant source of heat;

(c) All mixed-use developments.

A significant source of heat is considered to be a site with a high demand for heat, which would enhance the viability of a district heating network if it is connected: for example a swimming pool or a hospital. It could also consist of a site which offers the potential for the cost-effective recovery of waste heat, such as an energy intensive industry.

The hierarchical approach set out above enables a reasoned method by which to make the most appropriate choice and to ensure that the solutions are appraised logically. Electric heating is excluded from the hierarchy as it would be very likely to render connection to a future district heating network unviable, given the costs involved in carrying out structural alterations to retrofit the building(s) to a communal wet system. Electric heating is also more expensive option for customers to heat their homes.

All district heating networks must be of a scale and operated to maximise the potential for carbon reduction. They should be designed and operated energy efficiently, with the selection of optimum operating temperatures and measures to minimise heat losses. Developments that do not connect to or implement district heating networks or communal heating networks should be connection ready.

Key Design Considerations

Where development is required to provide infrastructure for connection to an area wide district network, at a high level, it should include the following:

- A centralised or communal, wet heating system which makes use of efficient, low temperature heat emitters such as underfloor heating where possible;
- Safeguarded pipe routes and pipework to connect the site to the district heating network;
- Optimised operating system temperatures to ensure compatibility with the district heating network.

Sufficient space for a substation/Heat Interface Units (HIUs) Table Q1 below provides an indicative space requirement to provide heat substations within a building:

Table Q1: Indicative space requirements

Heating capacity (kW)	Approximate building size (m2)	Space required to heating equipment
30	1000-1500	2
200	10000-15000	4
400	20000-30000	5
800	40000-60000	6

The consideration of the consumer needs is central to the good design of district heating networks. The design of a network should consider the consumer connections and the consumer heat demands for space heating and domestic hot water, and any industrial heat use that may be connected. From this starting point, the consumer connections of a system will determine temperature levels, temperature difference, pressure levels and the load profiles for the entire system.

Q5. District Heating Priority Areas

The Council commissioned consultants to undertake a Heat Mapping and Energy Masterplanning (HMMP) study which identified and evaluated opportunities for the development of district heating networks within Stratford-on-Avon District. This study informed the approach set out in Core Strategy Policy CS.3 and provided evidence for the identification of District Heating Priority Areas across the district. Following the mapping and assessment of planned and existing energy demands across the District, the study concluded that area-wide district heating networks are viable within the identified District Heating Priority Areas. For five specific District Heating Priority Areas, the study provided an initial techno-economic assessment and indicative pipe routes for potential future district heating networks within these areas.

In addition to the areas identified with the Stratford-on-Avon District Heating Priority Areas Map, district heating priority areas include the following:

1. Stratford-upon-Avon Canal Quarter Regeneration Zone (see fig 3);
2. Stratford-upon-Avon Town Centre Network (see fig 3);
3. Bridgeway, Stratford-upon-Avon Network (see fig 3);
4. Alcester Road, Stratford-upon-Avon Network (see fig 4);
5. Gaydon Lighthorne Heath Village Hub (see fig 5).

The Council's HMMP is available using the link below:

https://www.stratford.gov.uk/techevidence

Maps showing the identified District Heating Priority Areas (DHPAs)

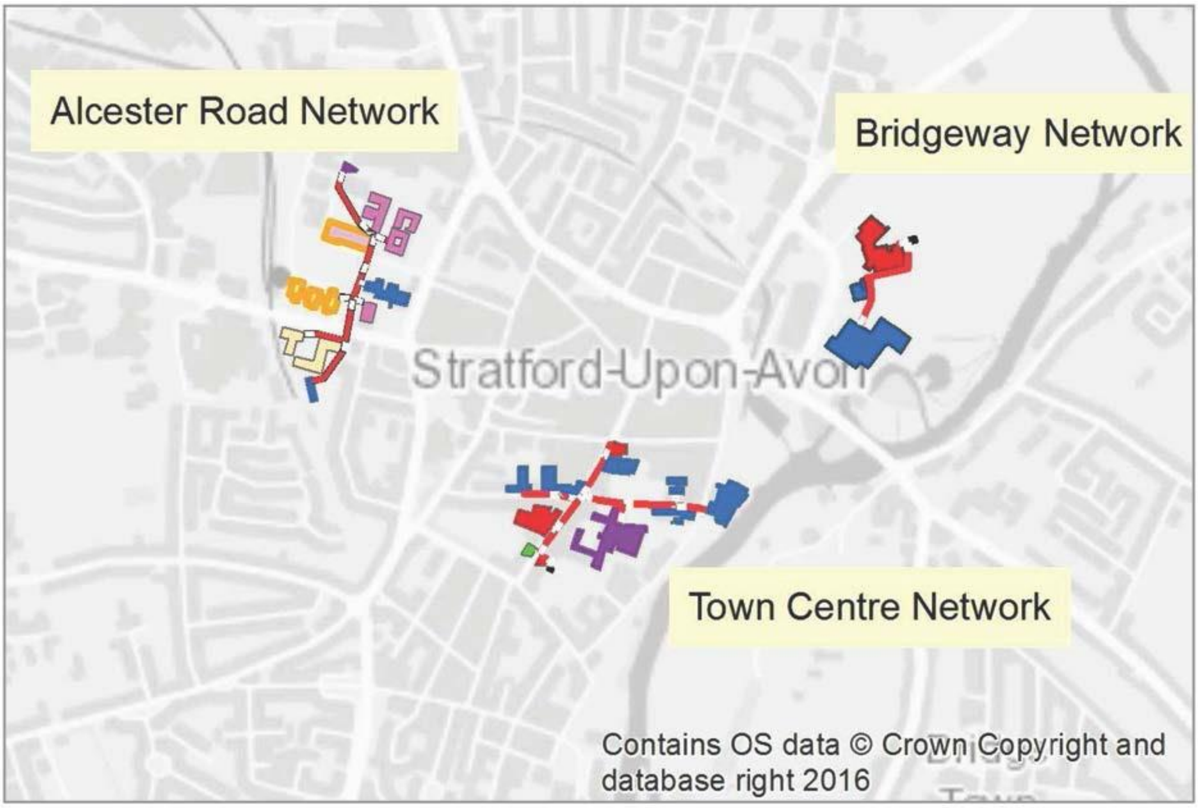

Fig. Q3 - Stratford-upon-Avon District Heating Priority Area (excluding the Canal Quarter).

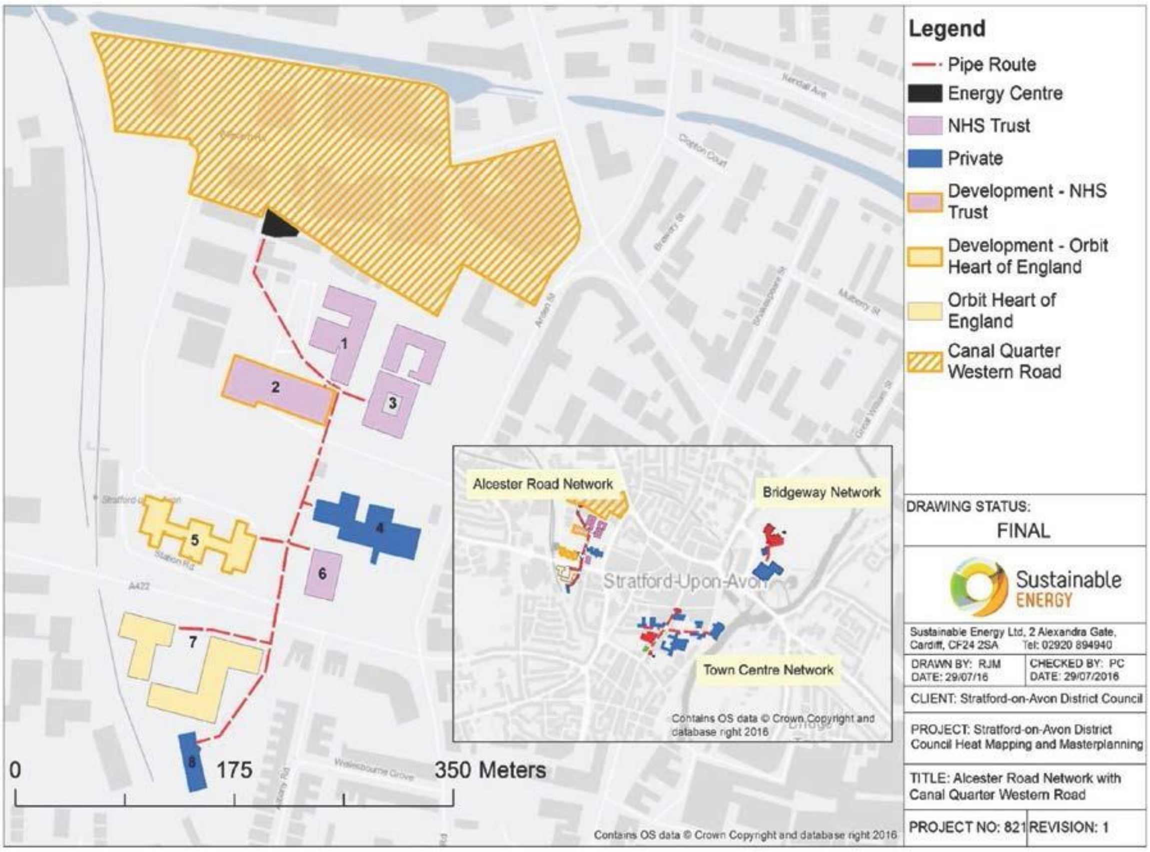

Fig. Q4 - Part of the Canal Quarter DH Priority Area (Western Road and Alcester Road). N.B. It should be noted that all of the Canal Quarter has been identified as a district heating priority area.

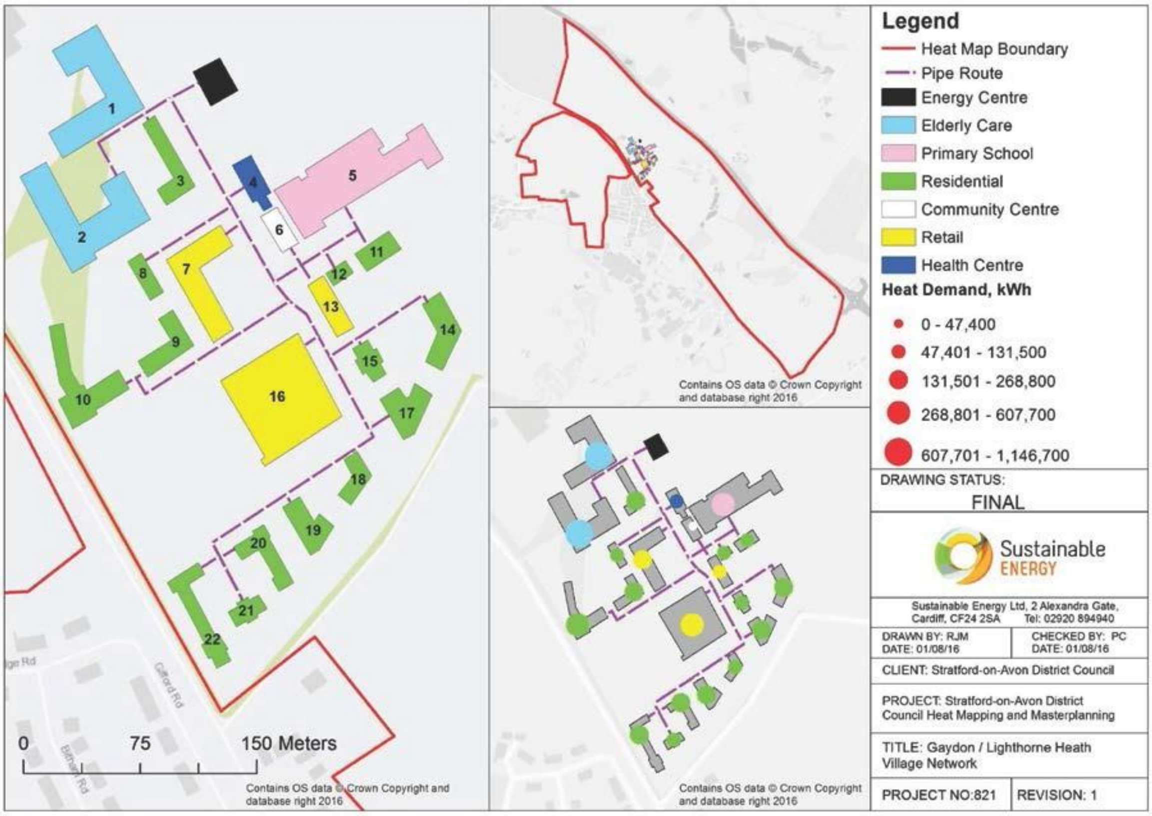

Fig. Q5 - District Heating Priority Area at Gaydon Lighthorne Heath.

Q6. Energy Statements

Applications for development within district heating priority areas, and/or those defined as sufficiently large or intensive developments should be accompanied by an energy statement. The energy statement should demonstrate and quantify how the development will comply with the heating and cooling hierarchy outlined in Section Q6. Stratford-on-Avon District Council will work proactively with applicants on major developments to ensure these requirements can be met.

Assessments of district heating network feasibility should:

- Be compliant with the Chartered Institute of Building CIBSE Heat Networks Code of Practice for the UK;
- be accompanied by viability (cost and financial implications) and feasibility (engineering and practical constraints) assessments;
- Include baseline energy consumption and carbon emissions calculations for regulated and unregulated energy use;
- Assess the potential to connect both residential and non-residential buildings to a heat network;
- Assess whether there are opportunities for heat offtake from nearby sites;
- Compare the economics of a heat network solution against a "business-as-usual" scenario (e.g. individual gas boilers);
- Present Internal Rate of Return, Capital Expenditure, and cost and carbon savings as outputs.

When assessing the proposals, officers will consider the following:

- The size of the development and the heat load and energy demands;
- The distance of the proposal from district heating network;
- The presence of physical constraints, such as main roads and railway lines;
- The cost of connection and the impact this has on financial viability;
- What efforts the applicant has made to secure agreements to create a new network through connection with nearby buildings or estates;
- The distance from the development of planned district heating networks;
- The proximity of any public sector buildings with communal heating systems, especially uses such as swimming pools, hospitals and large housing estates;
- Land use mix of proposed development;
- Land use mix and density of surrounding built environment.

Q7. Technical Specifications

Technical specifications are set out below for development proposals either connecting to existing or planned networks, or being futureproofed for connection to a future network.

New development will be required to adhere to the policy requirements to connect to district heating or include future proofing measures unless it has been demonstrated that it is not feasible or viable to do so.

The connection of buildings to district heating schemes requires careful consideration to ensure that it is compatible in design and operation for connection to a DH network. If a building is not correctly constructed, then the network operator will be unable to connect it without costly remedial work, or it may be connected and adversely affect the operation, technical and financial performance of the network. It is therefore imperative that networks are designed, constructed, operated and maintained in accordance with the Chartered Institute of Building Services Engineers (CIBSE)/Association for

Decentralised Energy (ADE) Heat Networks Code of Practice for the UK, 2016 or subsequent versions.

Technical Specifications Requirements

All buildings connecting to an existing or planned district heating network, or those required to be 'connection ready' must adhere to the relevant guidelines set out in the CIBSE Heat Networks Code of Practice for the UK. In particular, the Council or their representatives will monitor compliance with the following CIBSE Heat Network Code of Practice objectives laid out in Chapter 3 - Design:

- Objective 3.3 – to select suitable building interfaces, direct or indirect connection;
- Objective 3.4 – to design or modify suitable space heating and domestic hot water services systems; and
- Objective 3.9- to achieve an efficient heat distribution system within a multi-residential building and to reduce the risk of overheating.

Proposals should, as a minimum, meet the following requirements:

- All buildings must use a centralised, communal wet heating system which makes use of efficient, low temperature heat emitters such as underfloor heating where possible, rather than individual gas boilers or electric heating;
- Heat in the building should operate at an appropriate temperature for future connection to a heat network. The targeted difference between flow and return temperatures on the primary heat network under peak demand conditions shall be greater than 30^{O}C for supply to new buildings and greater than 25^{O}C for existing buildings. Objective 2.4 of the CIBSE Heat Networks Code of Practice for the UK outlines the preferred temperature design for varying heating systems in further detail;
- Plant rooms should be situated to consider the potential future pipe routes and sufficient space must be safeguarded for building/ network interface equipment (such as heat exchangers);
- The developer must identify, with the support of the Council or their representatives, and safeguard a pipe route to allow connection between the building and the highway or identified network route, which should remain accessible for future installation;
- The developer must not in any other way compromise or prevent the potential connection of the building to a planned network.

Applicants should refer to the Building Engineering Services Association; Early Design Building Connections Guidance' to ensure buildings are appropriately connected, using the following link below:
https://www.thenbs.com/PublicationIndex/documents/details?Pub=BESA&DocID=317602

Q8. S106 Agreements

Where connection to an existing or planned district heating network is feasible and viable or where a development is required to be constructed as 'connection ready', a commitment to connect may be secured through a legal agreement.

S106 Agreements to ensure connection to Existing or Planned networks

All development proposals will be required to contribute towards to the development of district heating networks, including by connecting to networks where they exist or are planned in the vicinity, unless it can be demonstrated that it is either not feasible or viable. In circumstances where the development will connect to an existing or planned district heating network, the Council will use S106 agreements to ensure that the connection takes place. Proposals should meet the requirements outlined in Section H8 Technical Specifications.

Developments located within District Heating Priority Areas and all sufficiently large or intensive developments are required to be designed to be able to connect to district heating networks; and unless a feasibility assessment demonstrates this is not feasible or viable:

- if located within 500 metres of an existing district heating network will be required to connect and meet associated charges;
- if located within 500 metres of a planned district heating network (likely to be operational within 3 years of planning permission, will be required to provide a means to connect and meet associated charges;
- if connection is possible, are required to detail a preferred energy strategy and an alternative energy strategy within their Energy Statements; and
- if connection is not possible, should develop and/or connect to a Shared Heating Network (developers will be obliged to look at neighbouring buildings to assess the applicability of expanding a site wide communal energy network beyond the site to a local neighbourhood).

S106 Agreements to ensure that buildings are 'connection ready'

In circumstances where the development is located within a district heating priority area, or where the development is sufficiently large or intensive, the Council may use S106 Agreements to ensure that developments are futureproofed for the subsequent connection to a district heating network. Proposals should meet the requirements outlined in Section H8 Technical Specifications.

Q9. Pre-application discussions

Each development site will have its own unique set of circumstances and opportunities that will affect the ability either to provide or connect to a district heating. It is therefore essential that discussions regarding district heating connection are commenced with the local planning authority as soon as possible. Applicants are strongly advised to seek pre-application advice from the District Council. For more information on this service can be found by either emailing planning.applications@stratford-dc.gov.uk or telephoning 01789 260304 or visiting the Council's website.
https://www.stratford.gov.uk/preapplicationadvice.

The following topics in respect of the provision of district heating might be discussed at the pre-application meeting:

- Potential of the development for district heating;
- Local Policy Requirements;
- Planning application boundary (this should be drawn to include all local supply pipework required for the connection outside the public highway)
- Specification of district heating connection/apparatus;
- The expected location and timing of the connection to the network; and
- Information to be submitted.

The Council's validation list should be referred to when submitting information for a planning application. Where proposals include district heating connection or future proofing measures, the following information might reasonably be requested, in addition to that already required for the development:

- Plans showing the pipe route and connection point to the wider network;
- High level technical specifications;
- Date of implementation and connection;
- Details of financial contributions;
- Feasibility and viability Assessment; and
- Energy statement demonstrating carbon and energy savings.

Other Consents

In addition to securing planning permission, you may need to consider obtaining other consents before work can start.

These include the following:

- Environmental Permitting Regulations (EPR);
- Works within Air Quality Management Area may require additional approval under the Clean Air Act (1993);
- Works within the highway may require a Street Works Licence under Section 50 of the New Roads and Street Works Act (NRSWA) 1991.

Find out more

CIBSE &ADE, 'Heat Networks: The Code of Practice in the UK: Raising the standards for heat supply, (CP1) 2015

http://www.cibse.org/knowledge/knowledge-items/detail?id=a0q200000090MYHAA2

CIBSE, HPA, GSHPA Surface Water Source Heat Pumps: Code of Practice for the UK (CP2) 2016

http://www.cibse.org/Knowledge/knowledge-items/detail?id=a0q200000090NmPAAU

Department of Business Enterprise and Industrial Strategy, Heat Networks Investment Project, 2016.

https://www.gov.uk/guidance/heat-networks-delivery-support