Connecting to the Bristol Heat Network

Part 1
a guide for developers, building owners and architects
About this document

This guidance is intended as information only. Prior to undertaking any design or legal work, or signing any agreements, appropriate engineering and legal advice should be sought.

Bristol City Council provides no warranty as to the accuracy of the information provided and accepts no liability for any loss, damage or inconvenience caused as a result of reliance on this information.

Acknowledgements

We would like to thank Sustainable Energy Ltd, Haringey Council and Stoke Council for their contributions to this document.

This document should be read in conjunction with Parts 2 and 3.

- Connecting to the Bristol Heat Network – Part 1 – (this document) - a guide for developers, building owners, architects and building services engineers
- Connecting to the Bristol Heat Network – Part 2 – a guide for architects and building services engineers
- Connecting to the Bristol Heat Network – Part 3 – legal and contractual information (available for relevant parties only, on request from Bristol City Council).

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Energy Service, Bristol City Council.

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# Contents

## 1 Background

1. The benefits of connecting to the Bristol Heat Network  
2. Why is Bristol City Council developing heat networks?  
3. Charges for connecting to heat networks operated by Bristol City Council

## 2 The purpose of this guide

1. Aims and objectives  
2. Who is it for?  
3. How the guidance is organised  
4. How this guidance relates to the key stages of designing and connecting a building to heat networks  
5. Scope and limitations of this guide

## 3 What are heat networks?

1. Bristol city heat networks  
   1.1 Existing networks in Bristol and proposed expansions  
2. Relevant planning policies  
   2.1 BCS13 – Climate change  
   2.2 BCS14 – Sustainable Energy

## 4 Before connecting – key issues for developers to consider

## 5 Meeting best practice - responsibilities of heat suppliers and customers

1. Responsibilities of building operators  
2. Responsibilities of building owner/operators purchasing heat directly from Bristol City Council

## 6 What to do next?

## 7 Appendices

1. Appendix 1 – overview of the development and planning process  
2. Appendix 2 – glossary  
3. Appendix 3 – further information and links to other resources  
4. Appendix 4 – frequently asked questions
1 Background

This document forms the first section of guidance, in three parts, on connecting to district heat networks developed by Bristol City Council.

It sets out:

- What heat networks are.
- The benefits of connecting to a heat network.
- Why Bristol City Council is developing heat networks and what it wants to achieve by doing so.
- How heat networks link to Bristol City Council’s planning policies.
- Key considerations at each stage of the design process for getting the most from heat networks.
- Typical scenarios for connecting to heat networks in Bristol and outline technical descriptions.
- An overview of how to optimise connections to Bristol City Council’s heat networks.
- The responsibilities of developers, owners and operators prior to connection.
- Sources of further information and guidance.

This document draws on a variety of guidance documents and other sources and, together with Parts 2 and 3, should be read in conjunction with Bristol City Council’s Core Strategy, Central Area Plan, Sustainability Practice Note, and information from other agencies. This includes, but is not limited to, information produced by the Chartered Institution of Building Services Engineers (CIBSE) and BSRIA1. You will find references to these sources of information throughout this document and in Appendix 3.

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1 BSRIA is an ISO 9001 registered test, instruments, research and consultancy organisation, providing specialist services in construction and building services. BSRIA is owned by The Building Services Research and Information Association.
1.1 The benefits of connecting to heat networks in Bristol

**The benefits for developers and building owners and operators**

- **Lower capital and operational costs.** Connection to a heat network is simpler than installing boiler plant equipment in individual buildings as these are replaced by a single heat substation. This means procurement, capital, operational, maintenance and replacement costs are lower than conventional heating solutions.

- **Space saving.** Heat substations require a much smaller footprint than conventional gas boilers, increasing the lettable/saleable floor area of developments.

- **Oversizing.** Because the heat network can adjust the temperature/volume of heat delivered to match exceptional periods of cold weather, it’s no longer necessary to oversize heating systems, meaning they are cheaper to install and maintain and operate more efficiently.

- **Secure.** In a volatile energy market, district heat can provide energy security and resilience through the utilisation of a variety of heat generation sources, long-term contracts and price guarantees. Unlike systems supplied by fossil fuels.

- **Future-proof.** Bristol City Council is making the transition to renewable and low carbon district heat so you won’t be tied into stranded technologies or fuels such as fossil fuels.

- **Compliance with Building Regulations and Bristol City Council Planning Policies, BCS13 and 14.** Connection to district heat can make it easier to meet the requirements of Parts L1A and 2A of the Building Regulations and is a requirement of Bristol City Council’s policy BCS14 for development in areas of the city where district heating is planned or in construction. Measures such as direct electric resistive heating do not meet the requirements of planning policy BCS14.

- **Improved air quality** – Our heat networks are designed in accordance with industry best practice, and reduce local air pollution when compared to multiple gas boilers.

- **Carbon reduction** – Connection to heat networks is a very cost-efficient way of reducing carbon emissions from existing buildings undergoing major refurbishment and replacement of heating systems, particularly those which are ‘hard to treat’, such as listed buildings or those with solid walls.

**Benefits for consumers of heat connected to heat networks**

- **Reduced energy costs** – Bristol City Council is committed to lowering the cost of energy by providing heat via heat networks. Greater efficiency of heat networks over individual gas boilers enables the council to deliver heat via its heat network at a cost lower than that of an equivalent gas boiler system and significantly lower than direct (resistive) electric heating.

- **Greater resilience to volatile energy prices**
  - By lowering the cost of energy and reducing volatility the council can assist business and domestic consumers.
  - Low cost heat helps to reduce the proportion of household income spent on energy and the incidence of fuel poverty.

- **Space saving** – Heat interface units (HIUs) require less space than a conventional gas boiler and hot water tank or a combination boiler.

- **Simple, clear tariffs** – Bristol City Council is committed to simple, clear tariffs which will typically be based on a standing charge and a heat charge based on metered heat consumption.

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2 An integrated unit for delivering and recording the heat consumed by an individual dwelling or building served from a heat network. It is a prefabricated unit which may include a plate heat exchanger for the production of hot water and a heat exchanger to separate the space heating circuit from the DH circuit, together with control valves and a heat meter.
1.2 Why is Bristol City Council developing heat networks?

Bristol City Council is committed to delivering heat networks in order to reduce the cost of heating our homes and businesses. Heat networks are an efficient and cost effective way to cut the carbon emissions produced from heating new and existing buildings, and they form a core part of the council’s strategy to make Bristol ‘carbon neutral’ by 2050.

In line with this long term objective and our interim targets to reduce carbon emissions, the council is committed to progressively lowering the carbon content of heat delivered via heat networks by switching to low and zero carbon sources of heat wherever they are financially viable. In the medium to long term this is likely include the connection to sources of waste heat, the use of heat pumps to extract solar energy from the ground, air and water, and potentially geothermal heat.

The council is also committed to ensuring that the heat it supplies is good value and fairly priced for all consumers.
### 1.3 Charges for connecting to heat networks operated by Bristol City Council

Bristol City Council charges developers a fee for connecting to its heat network. The charging structure is set out in *Connecting to heat networks in Bristol – Part 3 - legal and contractual information*.

The initial connection offer will contain a connection fee based on connection capacity and building type, but the final connection fee paid will be no more than 90% of the cost that would have been incurred by the developer to supply heat had a heat network not been available (the avoided cost). The connection fee will also take account of total heat demand, the profile of the heat demand and factors such as return temperatures. Efficient design of heating systems connected to the heat network will also enable lower capital costs as oversizing of boiler plant will be reduced.
2 The purpose of this guide

This document provides guidance on how new developments in Bristol should be designed, built and operated to expand and develop heat networks in the city as efficiently as possible. It also provides advice on how heating systems in existing buildings can be designed and operated to take full advantage of decentralised heat. Elements of this guidance will also be useful to designers of building-scale communal heating systems.

The guidance will be reviewed and revised as technologies, policies and practices progress.

2.1 Aims and objectives

The central aim of this guidance is to ensure that buildings connecting to heat networks in Bristol are designed, built and operated to maximise the efficiency and benefits of these schemes.

To do this, it is essential that internal heating and delivery systems are designed and operated such that the flow temperatures provided from the heat network and the temperature of water returning to the network (‘return temperature’) are as low as possible.

A low return temperature is essential because the efficiency of heat generation plant, be it boilers, heat pumps, or combined heat and power (CHP) units, improves the lower the return temperature is. Low return temperatures also reduce the size of the network’s pipes, reducing heat losses from the system and pumping energy.

Moreover, the good design of a building’s heating systems reduces the costly oversizing of boilers and pipework as well as reduces heat losses within buildings that can lead to overheating and higher bills for occupiers.
The specific objectives of this guide are to:

- Ensure that connections to heat networks in Bristol are carried out in accordance with the minimum requirements outlined in the Heat networks: Code of Practice for the UK (CP1-2015), published by CIBSE;
- Reduce the operating costs of heat networks in Bristol through good design and implementation;
- Reduce the carbon pollution and the carbon intensity of heat delivered via heat networks in Bristol through efficient design, operation and the use of low carbon and renewable heat sources;
- Ensure that heat networks in Bristol offer a low, cost-effective, affordable and fairly priced source of low carbon heat.

2.2 Who is it for?

This guide (Part 1) is intended for:

- Developers and their clients
- Building owners and operators
- Architects and engineers with responsibility for designing and implementing heat networks
  - Who should also refer to Part 2 - Connecting to the Bristol Heat Network - a guide for architects and designers of building services
- Non-domestic⁴ and domestic consumers of heat and other interested parties and stakeholders
- Planning officers

Part 2 - Connecting to the Bristol Heat Network - a guide for architects and building services engineers and Part 3 - Connecting to the Bristol Heat Network - legal and contractual information have been written for those with particular technical and legal responsibilities related to heat networks.

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⁴ www.cibse.org/knowledge/knowledge-items/detail?id=a0q200000090MYHAA2
⁵ Including commercial and retail consumers.
2.3 How the guidance is organised

The guidance comprises three parts:

<table>
<thead>
<tr>
<th>Connecting to heat networks in Bristol - Part 1 – a guide for developers, building owners and architects (this document).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 1 explains the objectives, benefits and responsibilities of connecting to heat networks in Bristol.</td>
</tr>
<tr>
<td>Available for download.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Connecting to heat networks in Bristol - Part 2 – a guide for architects and building services designers and engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 2 provides technical guidance specifying building heating design requirements and how connections should be made to heat networks in Bristol, in accordance with CIBSE guidance.</td>
</tr>
<tr>
<td>Available for download.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Connecting to heat networks in Bristol - Part 3 – legal and contractual information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 3 provides legal terms and draft agreements for developers seeking to connect to heat networks operated by Bristol City Council.</td>
</tr>
<tr>
<td>(Available to relevant parties only).</td>
</tr>
</tbody>
</table>

2.4 How this guidance relates to the key stages of designing and connecting a building to heat networks

The flow chart below outlines the key stages that can be expected from initial enquiry to ‘heat on’. Further relevant information may be found in the Bristol Development Framework Core Strategy\(^5\) (2011) and policy BCS14, Bristol Central Area Plan\(^6\) (March 2015), and the Climate Change and Sustainability Practice Note\(^7\) (2012).

The Heat Trust also provides relevant information, which may be found on their website: [www.heattrust.org/index.php/the-scheme](http://www.heattrust.org/index.php/the-scheme)

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\(^6\) [Bristol Central Area Plan](http://www.bristol.gov.uk/documents/20182/34540/BCAP%20Adopted%20March%202015%20-%20Main%20Document%20%26%20Annex%20-%20Web%20PDF.pdf/d05a6c22-ab91-4530-926a-f26160ab72a5)

\(^7\) [Climate Change and Sustainability Practice Note](http://www.bristol.gov.uk/documents/20182/239435/Climate+Change+and+Sustainability+Practice+Note+(December+2012+v2).pdf/32260c7-e3bf-4cae-92fd-12f14c966a3e)
Initial enquiry
Download Parts 1 and 2 of the Connection Pack from Bristol City Council

Connection request by developer
Using template form provided

Does connection request provide sufficient info?
YES

Connection offer
Bristol City Council provides offer for Connection Charge and Heat Tariff

Technical specifications agreed
Designs and specifications set out for contract are discussed and agreed

Commercial agreements signed
Bristol City Council provides final contract for Connection Charge and Heat Tariff for signature

Installation and commissioning (Bristol City Council may review secondary systems to ensure compliance with CIBSE guidance)
Bristol City Council will oversee installation of heat network connection, heat substation and associated equipment and inspect and accept work by developers

Heat on

Discuss with Bristol City Council

NO
2.5 Scope and limitations of this guide

This guide covers existing and future heat networks in Bristol. It is applicable to heat networks designed to supply new developments and networks that are retrofitted to supply existing buildings.

It does not cover district cooling or cooling networks, which will be addressed separately.
Heat in the form of hot water (shown by the red pipes) is supplied to multiple buildings from one or more energy centres (top right). Cooler water (blue pipes) returns to the energy centre for reheating.

3 What are heat networks?

The terms ‘district heating’, ‘heat networks’, and ‘district heat’ tend to be used interchangeably. They are used to refer to the supply of heat from a central source or sources, and to the physical infrastructure needed for the generation, storage, distribution and use of heat.

Heat networks range from small local networks supplying a small group of buildings to networks covering entire cities. Large networks, such as Bristol City Council’s, generally have more than one source of heat or energy centre situated at different points on the network. This guide refers to district scale networks being developed by Bristol City Council. It may also be relevant to networks being developed by private operators; however, you should also refer to guidance and information provided by them.

The main components of a heat network typically comprise:
- **A heat source** – heat may be generated by burning gas in a boiler or combined heat and power (CHP) unit but can also be derived from other energy sources including: biomass, solar and waste heat technologies such as solar collectors and heat pumps. (For example, the council’s Broughton Energy Centre combines biomass and gas boiler heat generation plant).

- **Heat delivery infrastructure, i.e. pipes** – these can be steel or plastic pipes of varying diameter laid in trenches. They are usually pre-insulated to a high specification to minimise heat losses.

- **Heat substation** – this transfers the heat from the heat network to the consumer (the building and occupants where the heat is required) and typically is located within the building it is supplying. In the council’s heat networks the heat substation is owned and operated by the council.

- **A heat interface unit (HIU)** – designed to supply heat to a single unit or property, such as a flat or house. It is located within the property and is similar or smaller in size than a domestic boiler.
3.1  Bristol city heat networks

3.1.1 Existing networks in Bristol and proposed expansions

In 2009, Bristol City Council began investigating the feasibility of installing heat networks beyond communal heating systems operating in council housing. A number of studies were undertaken to understand the demand for heat in the city and whether this could be met with heat networks.

In response to these the council has focussed on developing heat networks in high heat demand areas such as central Bristol: the Rowan Heat Network, the Temple and Redcliffe Network, and a network in the city centre referred to as ‘City Centre Phase 1’.

The Rowan Heat Network became operational in 2016 and connects five social housing blocks in the south of Bristol to a 360kW biomass boiler. The first part of the Temple & Redcliffe network is operational with further sections at the detailed design stage. The energy centre comprises a 1MW biomass boiler and 3.6MW of heat from gas boilers supplying over 700 flats within the Redcliffe area. Further expansion of this network is underway and City Centre Phase 1 is at the design stage.

The council is committed to the further expansion of heat networks in the city. For information on the latest developments please refer to the [www.energyservicebristol.co.uk/business/heat-networks/](http://www.energyservicebristol.co.uk/business/heat-networks/)
3.2 Relevant planning policies

3.2.1 BCS13 – Climate change

Policy BCS13 – Climate Change sets out a requirement for development in Bristol to take into account the impact of climate change. Development is required, by a variety of means, including heat networks, to both mitigate its own impact on climate change and to adapt to the effects of climate change.

This cross-cutting approach addresses a number of objectives in the Bristol Development Framework Core Strategy.

3.2.2 BCS14 – Sustainable Energy

This policy sets out a requirement for development to minimise its energy requirements and incorporate renewable and low-carbon energy supplies to reduce carbon dioxide (CO2) emissions. The policy also sets out broad criteria to be considered in assessing proposals for renewable and low-carbon energy development. In so doing, the policy addresses a number of objectives in the Bristol Development Framework Core Strategy.

BCS 14 states that:

"Proposals for the utilisation, distribution and development of renewable and low carbon sources of energy, including large-scale freestanding installations, will be encouraged. In assessing such proposals the environmental and economic benefits of the proposed development will be afforded significant weight, alongside considerations of public health and safety and impacts on biodiversity, landscape character, the historic environment and the residential amenity of the surrounding area.

Development in Bristol should include measures to reduce carbon dioxide emissions from energy use in accordance with the following energy hierarchy:

i. Minimising energy requirements;
ii. Incorporating renewable energy sources;
iii. Incorporating low-carbon energy sources.

Consistent with stage two of the above energy hierarchy, development will be expected to provide sufficient renewable energy generation to reduce carbon dioxide emissions from residual energy use in the buildings by at least 20%. An exception will only be made in the case where a development is appropriate and necessary but where it is demonstrated that meeting the required standard would not be feasible or viable.

The use of combined heat and power (CHP), combined cooling, heat and power (CCHP) and district heating will be encouraged. Within Heat Priority Areas, major development will be expected to incorporate, where feasible, infrastructure for district heating, and will be expected to connect to existing systems where available.

New development will be expected to demonstrate that the heating and cooling systems have been selected according to the following heat hierarchy:

i. Connection to existing CHP/CCHP distribution networks
ii. Site-wide renewable CHP/CCHP
iii. Site-wide gas-fired CHP/CCHP
iv. Site-wide renewable community heating/cooling
v. Site-wide gas-fired community heating/cooling
vi. Individual building renewable heating"

For further information on how heat delivered by one of Bristol City Council’s heat networks contributes towards the 20% reduction in residual emissions required under policy BCS14 please refer to Appendix 4 - Frequently Asked Questions. For more generation information please refer to Bristol Development Framework – Core Strategy June 2011.

4 Before connecting – key issues for developers to consider

Conventional boiler plant installed within a building for the generation of heat and hot water that is not connected to a heat network would typically operate with high flow and return temperatures. The Bristol City Council heat network is designed to operate at lower temperatures that will suit low carbon energy sources and so operate more efficiently.

‘Return temperature’ refers to the temperature of the hot water returning to the heat network from a building (or buildings) and is one of the most critical aspects of the design and operation of heat networks. It will govern the efficiency of heat production at the central plant, the pipe diameters in the network, the energy required to pump hot water around the network and network heat losses.

The return temperature is largely a function of the building’s heating system and its controls, so it is essential that developers work closely with Bristol City Council from initial feasibility through all stages of development and build out to commissioning of the system, to achieve low return temperatures. Initial commissioning is particularly important as it will be harder to adjust settings once the system is operational.

Designing heating and hot water systems to deliver consistently low return temperatures requires a different approach and mind-set to that employed for conventional heating systems using gas-fired boilers. With heating systems designed for gas boilers, the focus is usually on achieving high flow rates and ensuring radiators deliver their full output. To ensure this is the case, flow rates, and hence return temperatures, are often set higher than the design value.
For a heat network a different approach is required. Flow rates need to be balanced to no more than the design value and achieving the correct return temperatures should be the main commissioning objective. In other words, the heating system is used to extract as much heat as possible from the water supplied by the heat network before returning it.

The table below sets out some of the key considerations at each stage of development.

<table>
<thead>
<tr>
<th>Building development stage</th>
<th>Developer actions</th>
<th>Bristol City Council actions</th>
<th>Reason – why is this necessary?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility</td>
<td>Undertake a provisional assessment of heat demand temperatures under peak conditions.</td>
<td>Council to review demand temperatures.</td>
<td>This information, together with options for reducing return temperature, will be used to determine the most suitable temperatures for the heat sources supplying the heat network.</td>
</tr>
<tr>
<td></td>
<td>Refer to Connection Pack part 2 for methodology and design requirements (and CIBSE Code of Practice) to understand Bristol heat network flow and return temperature requirements.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Provide Bristol City Council with demand temperatures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>For new build and developments where the heating system is being refurbished, consider what changes are required to reduce return temperatures and optimise the system for operation as part of a heat network.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feasibility</td>
<td>For large projects, discuss proposed phasing with Bristol City Council.</td>
<td>Council to review phasing of development.</td>
<td>The development schedule has a bearing on the required heat capacity of the system, location of energy centres and heat sources.</td>
</tr>
<tr>
<td></td>
<td>This should identify which buildings will be connected, when they will be connected, and how the heat demand will increase over time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feasibility</td>
<td>Training</td>
<td></td>
<td>To operate heating systems connected to a heat network in the most efficient way, all those working on the system need to understand how this differs from the operation of a conventional heating system.</td>
</tr>
<tr>
<td></td>
<td>Review the training needs of those designing, constructing, commissioning and operating the system within the building(s).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building development stage</td>
<td>Developer actions</td>
<td>Bristol City Council actions</td>
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</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
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<td>--------------------------------</td>
</tr>
<tr>
<td>Design</td>
<td><strong>Provide accurate estimates of peak heat demands, annual heat consumption, and demand profile.</strong> These should be provided by appointed building services designers, who hold chartered engineer status and the CIBSE Heat Network Consultant qualification. Details of the M&amp;E designer and their qualifications should be provided to Bristol City Council with the technical information pack (refer to Part 2 for further details).</td>
<td>Council to review heat demands, and profile.</td>
<td>Peak heat demands will determine the size of the building’s heat network connection, pipe sizing and substation, the capacity of the building connections, and the capacity of the peak boiler plant. Connection fees and standing charges will be linked to the required peak heat demand and/or the avoided cost. The annual heat consumption and daily demand profiles will determine the capacity of the primary heat source and thermal storage.</td>
</tr>
<tr>
<td>Design</td>
<td><strong>Select suitable building interfaces.</strong> An assessment of the options for connection position within the development should be carried out in consultation with Bristol City Council.</td>
<td></td>
<td>The choice of interface position has a bearing on the cost of the connection.</td>
</tr>
<tr>
<td>Design</td>
<td><strong>Metering.</strong> The council will install heater meters at the point of supply to measure and record heat consumption. This data will be used for billing purposes. The heat bill will be made up of unit costs and standing charges and may include bonuses or penalties for meeting the agreed return temperatures.</td>
<td></td>
<td>Bristol City Council is committed to fair pricing and charging for heat. To do this, meters will meet EN standard accuracy levels and be correctly specified and installed.</td>
</tr>
</tbody>
</table>

9. www.cibsecertification.co.uk/Registration/Become-a-CIBSE-Heat-Networks-Consultant
<table>
<thead>
<tr>
<th>Building development stage</th>
<th>Developer actions</th>
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<th>Reason – why is this necessary?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td><strong>Optimise space heating and domestic hot water systems for connection to and operation as part of the heat network.</strong>&lt;br&gt;The building services designer will need to undertake a design study to incorporate low temperature heating systems and instantaneous hot water systems as defined in Part 2 of the connection pack.&lt;br&gt;The return temperature should be reduced as far as practical and agreed with Bristol City Council and the report should show how the new operating temperatures will be achieved through rebalancing or other changes.</td>
<td>Council to review proposed design and operation of the system.</td>
<td>The design return temperature is the key design decision for the heat network.</td>
</tr>
<tr>
<td>Design</td>
<td><strong>Optimise design and pipe routes to minimise costs.</strong>&lt;br&gt;The location of the plant room should take account of the routing of the heat network in order to minimise the length of pipe runs. Plant rooms need to be located on the correct side of the building/development to facilitate connection to the network and appropriately sized to accommodate the plant.</td>
<td></td>
<td>By reducing the length of pipe-runs the council can reduce the capital, operation, and maintenance costs of the network and the connection fee.</td>
</tr>
<tr>
<td>Design</td>
<td><strong>Minimise heat losses from secondary pipework to reduce heat demand and the risk of overheating.</strong>&lt;br&gt;Minimise heat losses from all heat distribution pipework within buildings. To reduce heat loss and minimise the contribution to overheating, insulation levels must comply with the requirements in Heat Networks – Code of Practice for the UK (CP1 – CIBSE 2015). It should be noted that these requirements significantly exceed those required to comply with Building Regulations.</td>
<td></td>
<td>Heat losses from small diameter branches to the final consumer (including secondary pipework) are usually the most significant heat losses across the whole network and can result in substantially higher heat charges for building occupiers. Excessive heat losses can also lead to unacceptable levels of summer overheating which will be more of a concern in well insulated buildings. It is essential that these issues are considered from the outset, as the optimum solutions may have architectural implications (e.g. for the number and location of vertical risers).</td>
</tr>
<tr>
<td>Building development stage</td>
<td>Developer actions</td>
<td>Bristol City Council actions</td>
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</tr>
<tr>
<td>----------------------------</td>
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</tr>
<tr>
<td>Construction (Build-out)</td>
<td><strong>Construct the system in accordance with CIBSE Code of Practice (CP1 – CIBSE 2015).</strong></td>
<td>Bristol City Council will inspect and sign-off the system against the CIBSE Code of Practice.</td>
<td>To operate efficiently the system needs to be designed and constructed in accordance with minimum requirements of the CIBSE Code of Practice (CP1 – CIBSE 2015).</td>
</tr>
</tbody>
</table>
| Commissioning              | **Commission building heating systems/controls to achieve consistently low return temperatures.**  
 Produce commissioning procedures for each type of heating circuit, building on commissioning plans drawn-up at the design stage based on CIBSE Commissioning Code M (CIBSE, 2003), CIBSE Code of Practice (CP1 – CIBSE 2015) and other guidance.  
 This should include co-ordination of commissioning of primary, secondary, and tertiary systems.  
 Bristol City Council will undertake a minimum of two inspections of the system during the commissioning phase. | | Initial commissioning of the system within the building is particularly important as it will be more difficult to change settings once the system is in operation. |
| Commissioning              | **Training.**  
 Ensure that all those responsible for commissioning and on-going operation and maintenance have received appropriate training. (Please refer to www.cibse.org for advice on relevant training courses). | | Commissioning is critical to the long term operation of the system.  
 Efficient operation of the system within building(s) is critical to maintaining low return temperatures. |
| Commissioning              | **Post occupancy monitoring.**  
 Implement a plan for ongoing monitoring of the system to ensure it is operating at maximum efficiency, low return temperatures maintained and to minimise the ‘performance gap’ between designed and actual energy use.  
 Display energy certificate in a prominent location where required. | | Monitoring and reporting of consumption has been shown to be effective at reducing the ‘performance gap’ and optimising energy efficiency benefits. |
5 Meeting best practice – responsibilities of heat suppliers and customers

5.1 Responsibilities of building operators

Successful operation of heat networks in Bristol requires building operators to meet their responsibilities to heat customers (the consumers of the heat). For heat operators supplying directly to domestic customers there are additional responsibilities and requirements for meeting best practice.

Bristol City Council proposes that building operators:

- Monitor the heat consumption of heat customers, and undertake investigations where there is significant divergence from typical trends to ensure that automatic meter reading and heat meters are operating correctly.

- Ensure that customers have information on the operation of the scheme on occupation and that this information is updated annually. This should include:
  - Information on the availability of the heat supply and the reason for any outages, and the terms under which compensation payments will be paid.
  - Information on how to operate the system within their building to deliver required comfort levels and minimise consumption.

- Ensure that heat network plant rooms are securely maintained and locked to prevent unauthorised access.

- Set up a phone helpline for customers to report faults and in case of emergency.

- Set up a complaints and dispute resolution procedure and ensure that customers are aware of it.

- Ensure that customers receive a minimum notice period of 2 days for planned outages.

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23 www.heattrust.org/index.php/the-scheme
And in addition, for operators supplying heat to domestic customers:

- Prepare billing in accordance with recommendations of the Heat Trust and the Energy Efficiency Directive, and,
- Meet the requirements of the Independent Heat Customer Protection Scheme (IHCPS).
- Ensure that, where prepayment meters are in use, adjustments in response to price changes are carried out within one month.
- Ensure that there are specific arrangements in place to communicate with vulnerable customers regarding operation and interruptions to supply.
- Prepare an information pack for prospective purchasers or renters about the heat network and expected charges. Ensure that this pack is regularly updated.

5.2 Responsibilities of building owner/operators purchasing heat directly from Bristol City Council

Customers should:

- Recognise the importance of maintaining low return temperatures and ensuring that the system operates as designed, as well as accepting and acting on advice provided by Bristol City Council.
- Not interfere with the system and not touch the valves or any parts of the council owned system except designated user controls. Where possible, lead seals should be used to check integrity.
- Follow a set procedure to check whether their system is at fault prior to calling the heat network operator (Bristol City Council).
- Ensure that all charges and fees levied in accordance with the contract between the customer and the Heat Network Operator are paid in a timely manner.
- Prevent unauthorised access to plant rooms and ensure that these are not used for storage of other equipment.
What to do next?

- Refer to the table/flow chart in Appendix 1 for a summary of the process of connecting to heat networks in Bristol.

- Contact the Energy Service at Bristol City Council to inform them that you are considering connection.

- Download Part 2 of this guidance: Connecting to the Bristol Heat Network - a guide for architects and building services designers, and contact your M&E designer or current building services operator.
7 Appendices

7.1 Appendix 1 – overview of the development and planning process

The table below provides an overview of the development and planning process. As this may be subject to change over time, please refer to the website [www.energyservicebristol.co.uk](http://www.energyservicebristol.co.uk) for updated versions.

<table>
<thead>
<tr>
<th>Development stage</th>
<th>Planning Process &amp; developer actions</th>
<th>Developer actions (technical)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1 - preparation &amp; policy context</strong></td>
<td>Refer to: Bristol Development Framework Core Strategy, Bristol Central Area Plan and Climate Change &amp; Sustainability Practice Note for policy requirements</td>
<td>Advise architect &amp; building services design teams of potential requirement to connect to DH network.</td>
</tr>
<tr>
<td><strong>Stage 2 - feasibility</strong></td>
<td>Pre-app. Submit a Pre-application to Bristol City Council Planning Department</td>
<td>If deemed suitable for connection to the DH network, undertake first estimate of annual heat demand and peak heat demand.</td>
</tr>
<tr>
<td></td>
<td>Note comments from Sustainability Team on energy &amp; sustainability strategy</td>
<td>Provide provisional figures to Energy Services Team.</td>
</tr>
<tr>
<td></td>
<td>Contact Bristol City Council Energy Services team regarding potential connection to DH network and development timescale.</td>
<td>Review design to reduce return temperature in line with BCC technical guidance and CIBSE CP1 - Heat Networks</td>
</tr>
<tr>
<td><strong>Stage 3 - technical design and legal agreements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stage 3a - technical design</strong></td>
<td>Submit a full planning application</td>
<td>Provide detailed estimates of peak annual heat demand, and design strategy to maintain low return temperatures.</td>
</tr>
<tr>
<td></td>
<td>Note comments from Sustainability Team on proposed energy and sustainability strategy</td>
<td></td>
</tr>
<tr>
<td><strong>Stage 3b - legal documentation and contract</strong></td>
<td></td>
<td>See above</td>
</tr>
<tr>
<td><strong>Stage 4 - construction</strong></td>
<td>Construct in accordance with specification submitted with planning application and with guidelines provided in Connecting to heat networks in Bristol - a guide for building services designers, engineers, CIBSE CP1 - Heat Networks, and specific requirements included within legal contract.</td>
<td>Ensure system is operating in accordance with BCC requirements and Best Practice.</td>
</tr>
<tr>
<td><strong>Stage 5 - commissioning</strong></td>
<td>Provide evidence of commissioning in accordance with conditions attached to the application</td>
<td>Commission in accordance with Connecting to heat networks in Bristol a guide for building services designers and engineers, and requirements set out in legal contracts/ agreements.</td>
</tr>
<tr>
<td><strong>Stage 6 - operation and customer service</strong></td>
<td>Provide evidence as required in planning conditions that system operating as required</td>
<td></td>
</tr>
<tr>
<td>Developer actions (legal)</td>
<td>BCC Actions</td>
<td></td>
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<tr>
<td>-----------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Advise legal team of requirement to connect to DH network</td>
<td>Provide additional information on request</td>
<td></td>
</tr>
<tr>
<td>Request copy of ‘Connecting to heat networks in Bristol - legal contracts and agreements’, from Energy Services team.</td>
<td>Review application regarding suitability to connect to DH network and timeframe.</td>
<td></td>
</tr>
<tr>
<td>Review estimated annual heat demand and peak heat demand as provided by developer</td>
<td>Review proposed design including annual and peak heat demand, return temp, &amp; proposed connection to DH network.</td>
<td></td>
</tr>
<tr>
<td>Review design spec including return temperatures.</td>
<td>Agree design with developer.</td>
<td></td>
</tr>
<tr>
<td>See below</td>
<td>Provide advice as required</td>
<td></td>
</tr>
<tr>
<td>Review commissioning requirements set out in legal contracts/agreements</td>
<td>Review evidence that system has been commissioned in accordance with Best Practice and technical and legal requirements</td>
<td></td>
</tr>
<tr>
<td>Ensure system meets contractual requirements.</td>
<td>Review operation of system to ensure it is meeting technical requirements (including return temperature) and customer service requirements.</td>
<td></td>
</tr>
</tbody>
</table>
## Appendix 2 – glossary

The table below provides an overview of the development

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat substation</td>
<td>A main heat exchanger between the heat network and the building heating/DHWS systems, together with controls and metering.</td>
</tr>
<tr>
<td>Combined heat and power (CHP)</td>
<td>The production (generation) of heat and electricity simultaneously in a single process to improve primary energy efficiency compared to the separate generation of electricity from a power station and heat from boilers.</td>
</tr>
<tr>
<td>Decentralised energy network(s) / Heat network</td>
<td>An existing heat/electricity or cooling network, or one which is proposed/in development, to which a building or buildings can connect. District heat and district heating are commonly used interchangeably with the terms decentralised energy networks and heat networks.</td>
</tr>
<tr>
<td>Demand, maximum demand, demand profile</td>
<td>The rate at which energy is required, expressed in kW or MW. Peak load or peak demand are commonly used to refer to heat energy. A graph of demand rate over a typical day, for example, is the demand profile.</td>
</tr>
<tr>
<td>District cooling (DC) / cooling networks</td>
<td>The provision of cooling energy to a group of buildings usually in the form of piped chilled water from one or more centralised cooling sources.</td>
</tr>
<tr>
<td>District heating (DH) / heat networks</td>
<td>The provision of heat to a group of buildings, district or whole city usually in the form of piped hot water from one or more centralised heat sources.</td>
</tr>
<tr>
<td>Energy service company (ESCo)</td>
<td>A company providing a total energy supply service that takes responsibility for the provision, financing, operation and maintenance of energy facilities. Energy services contracts may be worded to define the outcome of the service provided, such as temperatures and light levels, rather than how much energy is to be supplied.</td>
</tr>
<tr>
<td>Heat exchanger</td>
<td>A device in which heat is transferred from one part of an energy system to another. In the case of a heat network heat is exchanged from one fluid stream to another, without the fluids mixing. To exchange heat there must be a temperature difference between the streams. Heat exchangers are characterised in terms of their method of construction or operation for example plate, shell-and-tube, and rotary.</td>
</tr>
<tr>
<td>Heat meter</td>
<td>A heat meter measures thermal energy from a heat source or delivered to a building or point of use. This is achieved by measuring the flow rate of the heat transfer fluid and the change in its temperature (ΔT) between the outflow and return legs of the system. Heat meters are used for heat networks/district heating systems to measure the heat delivered to consumers and for industrial processes.</td>
</tr>
<tr>
<td><strong>Heat Trust</strong></td>
<td>An initiative to protect the interests of householders and micro businesses connected to heat networks. Refer to <a href="http://www.heattrust.org">www.heattrust.org</a> for more information.</td>
</tr>
<tr>
<td>----------------</td>
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</tr>
<tr>
<td><strong>Hydraulic / heat interface unit (HIU)</strong></td>
<td>An integrated unit for delivering and recording the heat consumed by an individual dwelling served from a heat network. It is a prefabricated unit which may include a plate heat exchanger for the production of hot water and a heat exchanger to separate the space heating circuit from the DH circuit, together with control valves and a heat meter.</td>
</tr>
<tr>
<td><strong>Low temperature hot water (LTHW)</strong></td>
<td>Hot water up to 95 degrees Celsius used for space heating and low temperature processes.</td>
</tr>
<tr>
<td><strong>Low / zero carbon (LZC) technology</strong></td>
<td>These include renewable technologies such as photovoltaics, solar water heating, and biomass. The term is also used to refer to low carbon technologies such as combined heat and power (CHP).</td>
</tr>
<tr>
<td><strong>Maximum demand</strong></td>
<td>The maximum power, measured in kW or kVA, supplied to a supply/distribution company. It is equal to twice the largest number of kWh or kVAh consumed during any half-hour in a specified period (usually a month). Charges for maximum demand usually vary seasonally.</td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td>The distribution system which links the point where heat is generated to the point where it is used. For example, the pipes which transfer heat in the form of hot water.</td>
</tr>
<tr>
<td><strong>Shared heat network</strong></td>
<td>A heat network created as part of a new development which includes connection of neighbouring buildings.</td>
</tr>
<tr>
<td><strong>Thermal storage</strong></td>
<td>The storage of heat, commonly in an insulated tank as hot water. Thermal storage provides a buffer against peak demand. The water may be pressurised in order to maintain it at a higher temperature.</td>
</tr>
</tbody>
</table>
7.3 Appendix 3 – further information and links to other resources


- **Bristol Central Area Plan (March 2015)** – sets out planning policies specific to the ‘Central Area’. Available to download from: www.bristol.gov.uk/documents/20182/34540/BCAP%20Adopted%20March%202015%20-%20Main%20Document%20%26%20Annex%20-%20Web%20PDF.pdf/d05a0c22-ab91-4530-926a-f26160ab72a5

- **Climate Change and Sustainability Practice Note (2012)** – provides supporting information and guidance on the implementation of planning policies. Available to download from: www.bristol.gov.uk/documents/20182/239435/Climate+Change+%26+Sustainability+Practice+Note+%28December+2012+v2%29.pdf/322600c7-e3bf-4cae-92fd-12f14c966a3e

- **BSRIA** is a non-profit distributing, member-based association, owned by The Building Services Research and Information Association. It provides a range of best practice guidance on topics including heat networks. Further information is available here: www.bsria.co.uk/

- **Heat networks: Code of Practice for the UK. CP1 – 2015.** Published by CIBSE and The Association for Decentralised Energy. Further information is available here: www.cibse.org/knowledge/knowledge-items/detail?id=a0q20000090MYHAA2
7.4 Appendix 4 – frequently asked questions

If a new or refurbished building is connected to a heat network in Bristol does this count towards the reduction in residual emissions required under policy BCS14?

Decentralised heat, heat delivered via a heat network, is treated as an energy efficiency measure under Bristol City Council policy BCS14. This means that the reduction in residual emissions required under the policy, though the use of on-site renewable heat or power, is still required, and should be calculated after the application of energy efficiency measures which include measures such as decentralised heat.

The carbon factor for decentralised heat, defined as the quality of carbon dioxide emitted for each unit of heat generated, and measured in kg/kWh, should be based on figures provided by Bristol City Council for the heat network to which the building will be connected.

The lower carbon intensity of decentralised heat does decrease the total amount of energy which has to be generated renewably in order to achieve the percentage reduction in emissions required under policy BCS14.

For further information on completing the calculations for policy BCS14 within an Energy Statement please refer to the Climate Change and Sustainability Practice Note (2012)\textsuperscript{11}

The carbon content of mains electricity is reducing; why can't we specify electric heating?

The development of heat networks in Bristol is one part of the council’s strategy to reduce the carbon content and environmental impacts, including air pollution, of heat for new and existing buildings in the city. Council operated networks already include biomass, a renewable form of heat, in combination with mains gas, to reduce the carbon content of heat.

The council is preparing a strategy for progressively reducing in the carbon content of decentralised heat in-line with high-level commitments for Bristol to be ‘Carbon neutral’ by 2050, which takes account of projected reductions in the carbon content of mains electricity.

Planning policy BCS14 – Sustainable Energy, allows for site-wide renewable CHP, site-wide renewable community heating/cooling and individual building renewable heating where connection to heat networks is not an option.

Electric resistive heating is not allowable under BCS14 for a number of reasons. These include the finite capacity of the electrical distribution network in the city and an anticipated increase in demand on the network from other uses such as charging electric vehicles. Furthermore, projected reductions in the carbon intensity of grid electricity over time are predicated on the use of heat pumps, and not the widespread adoption of resistive heating as a replacement for gas boilers.

Does my development have to connect to the heat network?

The sustainable energy requirements for new developments are set out in the Bristol Development Framework Core Strategy – Adopted in June 2011. New development will be expected to demonstrate that the heating and cooling systems have been selected according to the heat hierarchy set out in the strategy.

New development in heat priority areas will be expected to connect to the heat network where it exists or be ‘district heating ready’\textsuperscript{12} to enable connection to the network at a later date.

How much does it cost to connect to the heat network?

Fees for connecting to the heat network and the standing charges will be linked to the required peak heat demand and/or the avoided cost.

The initial connection offer will contain a connection fee based on the connection capacity and building type but the final connection fee paid will be no more than 90% of the cost that would have been incurred by the developer to supply heat had a heat network not been available (the avoided cost).

The connection fee will also take account of total heat demand, the profile of the heat demand and factors such as return temperatures.

\textsuperscript{11, 12} www.heattrust.org/index.php/the-scheme