



Heat Network Asset Transfer from BCC to BHNL Cabinet Paper
Appendix A – Further Essential Background Information



**ENERGY
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ONE CITY**

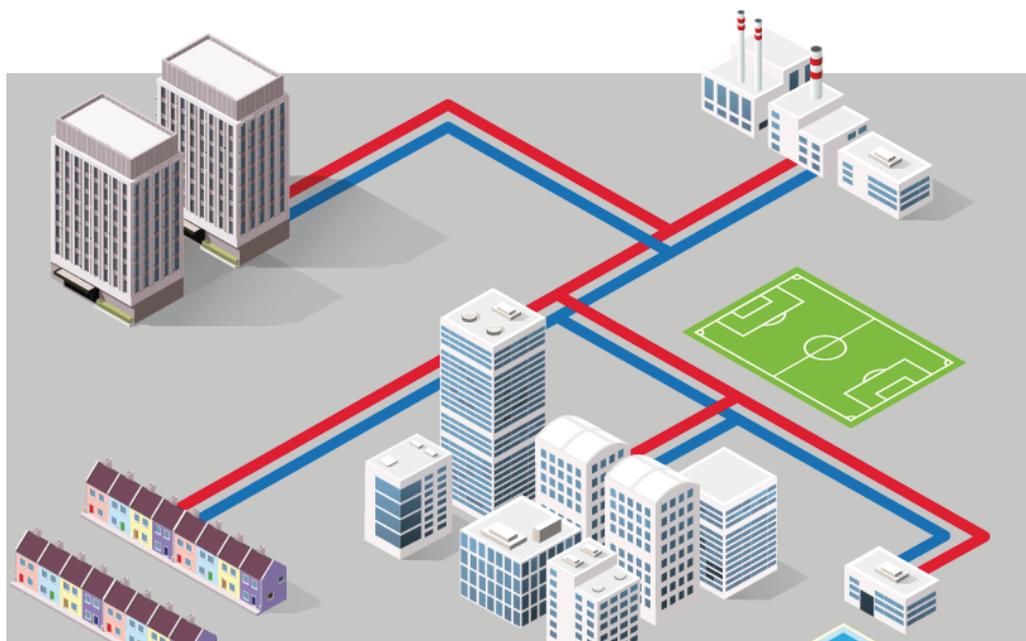
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Why Heat Networks?

Heat networks, also known as district heating, are systems for distributing heat generated in a centralized location via a network of pipes for domestic and commercial space heating and water heating.

As the heat network is agnostic to the type of heat generation installed, it can supply heat from a variety of energy generation technologies and most crucially from low and zero carbon technologies such as water source heat pumps as well as biomass and waste heat from industrial processes. This ensures heat networks are a 'no regrets' technology able to deliver heat whatever the heat generation technology available.



Heat networks using low or zero carbon energy technologies is the most viable methods of cutting carbon emissions in high density urban areas as the only other currently viable alternative would be the retrofitting of air source heat pumps to every building which will need to overcome significant building challenges such as the structural ability for buildings to be retrofitted with this technology.

The Bristol Heat network already operates with various low and zero carbon heat sources including the newly installed water source heat pumps (WSHP) supplying heat from the floating harbour, Gas CHP and the biomass boiler within the Broughton House Energy Centre. The wider network will also be investigating other heat sources such as heat from mines and sewers.

Heat Pump Technologies - take heat typically from the ground, water or air although Energy Services are also investigating using them to obtain heat from sewers. The heat obtained is then transferred into buildings or a district heating system. The technology used is the same as that used in refrigerators. Just as a fridge extracts heat from the food and transfers it into the kitchen, so a water source heat pump extracts heat from the water and will transfer it to the heat network. For every unit of electricity used to power the heat pump, approximately 3-4 units of heat are captured and distributed.

Although only 2% of heat in the UK is currently supplied by heat networks, this is rapidly increasing, particularly in cities. They are supported by UK government who have recognised that around 20% of heat could be supplied by heat networks across all five future energy supply scenarios contained in the Clean Growth Strategy, which was published by Central Government in 2017. Major European cities like Vienna

and Copenhagen have installed heat networks supplying over 95% of homes. Consequently, Copenhagen is on track to be carbon neutral by 2025.

In the UK, almost all cities have either installed or are looking to install heat networks. London currently has the greatest number of heat networks with London boroughs such as Enfield and Islington taking a lead. A number of large towns are also installing heat networks. For example, Gateshead has completed a £25 million heat and power network supplied from a Gas CHP energy centre.

Heat networks are central to achieving the Mayor's goal for Bristol to be a carbon neutral city by 2030 as well as help to tackle fuel poverty by providing heat to residents at lower prices. In confined urban areas like central Bristol, it can be argued that heat networks provide the only financially and technically viable solution for zero carbon heat.

BCC and BEIS have over the past few years commissioned various studies that confirm the importance of a Bristol Heat Network to the net zero carbon target. This included the CSE report on what Bristol needs to install to meet the net zero challenge by 2030 at least cost which recommended that over 70,000 buildings in Bristol be connected to a heat network with the remaining 90,000 buildings install an individual building solution such as air source heat pumps.

Installing heat networks will also support the following corporate strategy key commitments:

- Improve our environment to ensure people enjoy cleaner air through supporting the further deployment of renewable heat generation.
- Improve physical and mental health and wellbeing by making residents' homes warmer and cheaper to heat, reducing inequalities and the demand for acute services.
- Tackle food and fuel poverty by reducing energy bills.
- Create jobs, contributing to a diverse economy that offers opportunity to all and makes quality work experience and apprenticeships available to every young person.
- Increased resilience against fossil fuel price shocks.
- Reduce energy consumption and operating costs for building occupiers, improving Bristol's competitiveness for attracting new businesses to the city.
- Reduce costs for developers as they no longer need to install and maintain expensive heat generation plant and equipment.
- Increase the City's energy security and resilience.

Net zero, Bristol Heat Network Ltd and City Leap

BCC received over £10m in UK gov HNIP grant funding for the Redcliffe Phase 2 and Old Market heat networks and one of the conditions for the funding was that BCC would set up a Special Purpose Vehicle company (SPV) where the heat network assets would be incorporated.

In 2020 BCC met this condition through the setting up of Bristol Heat Networks Ltd (BHN), an SPV wholly owned by Bristol City Council.

BHN is the current operating SPV for the Old Market and Redcliffe Phase 2 networks but will also include the Bedminster heat network which is currently under construction

Whilst Bristol’s heat network is one of the fastest growing heat networks in the UK, as identified by CSE in its Bristol net zero report, if the 2030 net zero carbon target is to be met, the Bristol heat network will need to be expanded much further and much quicker than would be possible by BCC building the network on its own.

Moreover, the cost of developing such a network is likely to cost in the order of £1 billion. This significant sum is well beyond what BCC as a local authority can provide on its own.

To deliver such an ambitious infrastructure project requires the investment and expertise of large 3rd party organisations which is exactly what City Leap is intended to deliver. In Vattenfall, BCC has secured the support of one of the major heat network operators within Europe that currently manage heat networks in Berlin and Amsterdam as well as networks within its home country of Sweden (Vattenfall is owned by the Swedish state)

As part of City Leap, all BCC’s heat network assets not currently managed as part of BHN will be transferred to the SPV so that on completion of the City Leap agreement, a single transfer of BHN to Vattenfall can take place, enabling Vattenfall to progress the expansion of the Bristol Heat Network

Current Bristol heat network grant funding

Figure 1: Heat network currently installed to date and buildings connected (inset – Bedminster network – For illustrative purposes only)

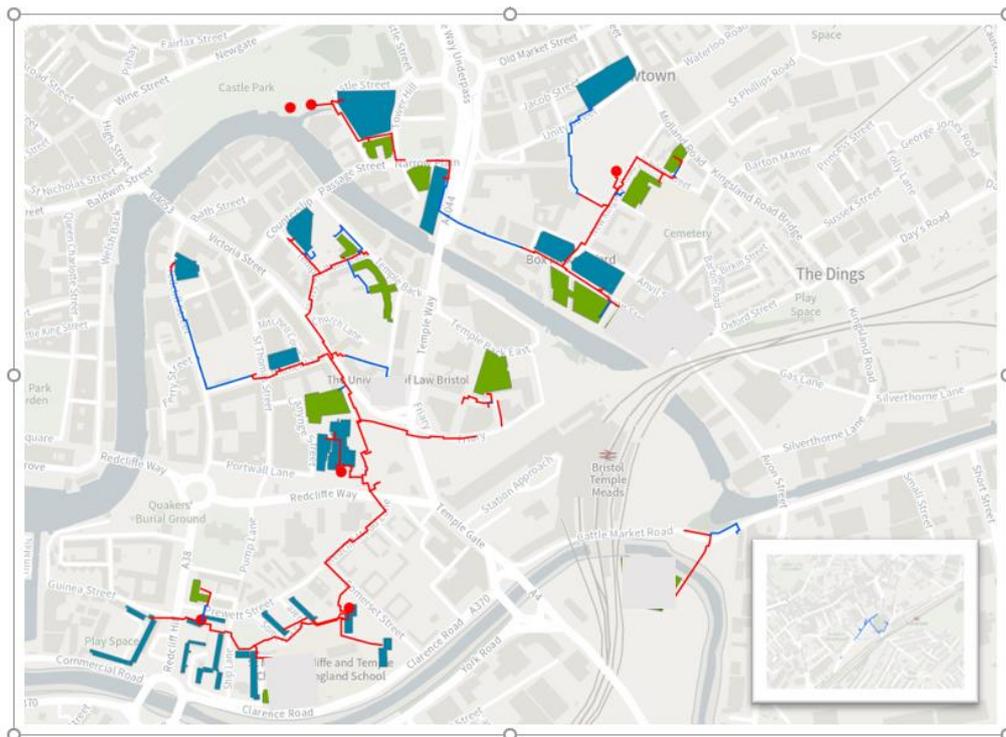
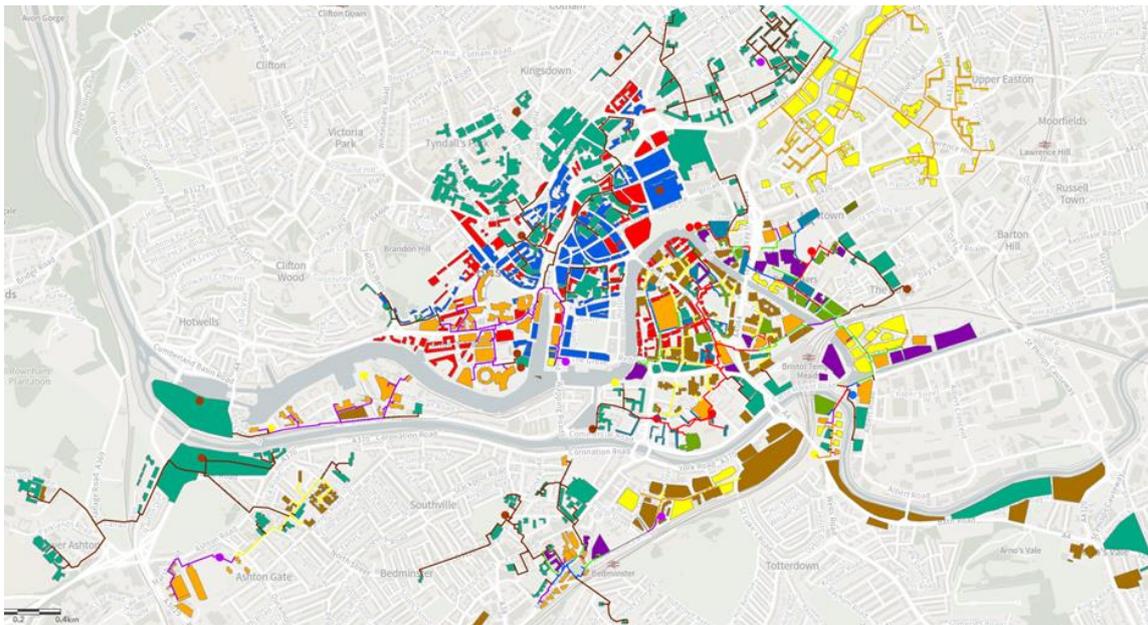


Figure 2. Heat networks in development expected to be developed by City Leap



Work to date / in progress

Old Market Heat Network

The Old Market Network is currently supplying heat to new developments in the city including the new developments of Castle Park View, Box Makers Yard and Assembly. Student housing in Unity St and affordable homes in Midland St are also currently being connected.

The Old Market network is also being extended to supply existing buildings including the Central Health Clinic and Hannah Moore Primary School following BCC successfully applying for £6.9 million of Public Sector Decarbonisation Scheme (PSDS) grant funding. These and other PSDS connections will be completed in summer 2022

The network is currently supplied by the Castle Park Energy Centre which includes a 3.1MW Water Source Heat Pump (the largest in the UK) drawing waste heat from the floating harbour along with peak and reserve gas boilers. An interim gas boiler energy centre is also in operation but will soon be switched off as the network is full served by the Castle Park Energy Centre.

Figure 3 Castle Park Energy Centre during construction:



Redcliffe Heat Network

Phase 1 of the Redcliffe network completed in March 2016 which included the installation of a 1MWth biomass energy centre at Broughton House (Redcliffe) supplying low carbon heat via underground heat mains to 13 social housing blocks. This network also includes older assets belonging to HRA including pipework connecting the blocks and assets in the plantrooms at Broughton House and Canynge House, which includes some gas boilers.

Figure 4: Biomass energy Centre Broughton House and Laying of Rehau PEX pipe as part of Redcliffe Phase 1:



Heat network installation was also installed as part of the Temple Gate highway works in order to enable the Redcliffe heat network to be connected to a city-wide heat network that also includes buildings adjacent to Temple Meads.

Phase 2 of the Redcliffe heat network is also now in operation and extends Phase 1 of the network to supply additional buildings in the Redcliffe area including BCC's 100 Temple St office and new developments such as student housing at 21 St Thomas St with further connections happening as new developments currently in construction require heat (Halo, Coopers Court, Aspire etc)

In addition to extending the network, Phase 2 also includes the installation of the 2nd Redcliffe energy centre at 100 Temple St supplying heat and electricity from a 0.55 MWe Gas CHP engine as well as peak and reserve gas boilers to increase resilience.

Similar to Old Market, PSDS grant funding is also being used to connect existing public sector buildings to the network. These include Temple Back Fire station and St Mary Redcliffe School 6th Form as well as replacing inefficient plant with modern plate heat exchangers within the Redcliffe social housing blocks.

Bedminster Heat Network

Construction has begun on the Bedminster heat network that will initially supply new developments as part of Bedminster Green.

The £11.6m Bedminster network received £1.3 million of commercialisation grant funding and a £3.27m loan from BEIS with the remaining funds from building connection fees and BCC prudential borrowing.

Work on the network has commenced early to ensure it is installed as part of major highway works in the area with a large air source heat pump (ASHP) energy centre being proposed as the low carbon technology supply to the heat network

Temple Heat Network

BCC received a commercialisation grant of £1.8m for this heat network that will serve new developments in the Temple Quarter Enterprise Zone including the Temple Island developments and the new University campus.

The proposed £20m project is planned to be developed as part of City Leap but has already received £1.8m of commercialisation grant funding from BEIS to progress this project to detailed design ready for City Leap to progress the capital installation (subject to Cabinet approval).

Future Heat Network plans

Master planning and feasibility studies have also been completed for a City Centre, Ashton Gate, Frome Gateway and Spike Island heat networks (incorporating Western Harbour). These and other heat networks in Bristol yet to be investigated will also need to be developed as part of City Leap to support the city's net zero ambitions.

Strategic Heat main

In addition to City Centre heat networks utilising locally sourced low and zero carbon heat, to meet the demand for heat it has been identified that a large district heating pipe will also need to be installed from Avonmouth to the City Centre to utilise waste heat from the energy from waste (EFW) plants in Avonmouth that is currently being wasted.

As well as providing heat to the City Centre it will also enable further heat networks to be built out along the route

Actions required

To comply with grant funding conditions, regularize current arrangements and provide for the City Leap procurement, heat network assets need to be transferred to BHNL.

Transfer of Heat Network Assets

All of the Heat network assets are required to transfer to BHNL in order that a single owner and operator of the heat network is appointed. The assets will include all the recently completed and in construction assets such as Old Market and Redcliffe Phase 2 heat networks but also other network assets such as the heat network installed as part of the Temple Circus highway works.

In addition, heat network assets currently under BCC HRA control will also need to be transferred. This is the primary heat network pipework and some plantroom assets currently serving social housing residents of the Redcliffe social housing blocks.

The rationale for this transfer is that this primary network pipe enables individual blocks to be supplied by the BHN in line with how the heat network has been installed elsewhere and allows the whole heat network to be operated and maintained and extended by a single organisation.

This will ensure that in line with other parts of the network, the currently controlled HRA network is able to receive the same level of energy security and operation as other heat network customers.

Currently, the HRA manage this part of the network and energy supply is managed by BCC Energy Service. Once the network is transferred, the prices will be set in line with the current contractual heat network connection and supply agreements used elsewhere on the network

Consumer Pricing

BHN have a set Connection and Bulk Supply Agreement which is provided in the same format to all those connecting and being supplied to the network. This includes a set pricing methodology.

- The standard supply agreement details and secures the arrangements for the ongoing supply of heat to the building, including: the price paid for heat, metering and billing arrangements, maintenance obligations for the supplier, and Guaranteed Standards of Service provided.
- HRA as a customer will have obligations that relate to the timely payment of bills and operation of the buildings heating system so as not to impact the rest of the heat network.
- On Pricing and Billing:
 - Variable - Heat Charge
 - Heat charge per unit (kWh) of heat consumed by each housing block – metered and charged at the point of bulk supply to substation – and passed on to tenants by the HRA.
 - No costs associated with maintenance or capital investment included within this price.
 - Fixed – Service Charge
 - Fixed annual cost covering all maintenance (and replacement when necessary) of everything up to and including the substation equipment. This is calculated as a £ per kW for the substation size.
 - Not passed through directly to residents.
 - The equivalent current costs would include annual maintenance contract costs and sinking fund / capital investment costs. This means that BHNL would be, for example, responsible for the replacement of a boiler.
 - This is a change to HRA’s current arrangements, where new equipment would be funded from a capital replacement budget
 - Indexation
 - The fixed and variable prices will adjusted/indexed on an annual basis against industry indices. All calculations and indices used will be publicly available to ensure transparency in repricing.
 - Billing
 - The breakdown of charges will be separated on the monthly heat supply bills for each substation, so the costs of these can be allocated by BCC HRA to tenants in the same way that they are currently.

Heat rates have been provided to the HRA. These are detailed within each Supply Agreement for each block and these contractual requirements would be transferred should City Leap be approved.

The Energy Service has analysed the new pricing and compared it with current arrangements. Whilst this varies depending on wholesale fuel prices, in all cases the new pricing was shown to be the same or cheaper than the current methodology.

There is potential for further savings in the future, as Bristol Heat Networks continues to diversify its heat generating assets, any remaining reliance on volatile gas and electricity supply will be reduced and the network should be able to provide heat at a price that is stable and offers value for money.

In the event of the onward sale of shares in BHNL to Vattenfall Heat UK Limited being approved, there are various safeguards in place with regard to consumer pricing as set out below.

The City Leap Concession Agreement contains provisions around operating the heat network and minimum standards to be achieved in operation of the heat network following the transfer to Vattenfall. The provisions in the Concession Agreement include where domestic supply agreements are in place compliance with the Heat Trust Scheme rules. There is also a stipulation that any connection agreement or supply agreement shall be substantially in the form of the precedent agreements currently in place. Vattenfall is to provide fair and transparent pricing which demonstrates savings or parity against an air source heat pump counterfactual for customers.

Where there may be deemed to be an impact on customers, public engagement or consultation as appropriate will take place. The outcome of which will be taken into account before any final decision is made.

Although still subject to contract Vattenfall's proposals regarding fair and transparent pricing are as follows:

- Vattenfall shall provide each Customer with visibility of their energy consumption, tariff and tariff construction that will allow Customers to assess where their heat is coming from and how it affects their bills.
- Vattenfall commit to always beating the variable cost of heat from the appropriate counterfactual for supply agreements.

The heat network is a Strategic City Asset and in the Concession Agreement the Strategic Partner commits contractually to fair and transparent pricing for Customers in Schedule 8, paragraph 3. Vattenfall will honour the prices and Supply Agreements in place with all Customers connected to the Heat Network. There is a contractual commitment in Clause 4, Appendix 1 to Schedule 14 of the Concession Agreement to publicly disclose fixed charges, tariffs and unit rates on the BHN website.

The proposed structure for pricing provides fairness and transparency to Customers as it accurately reflects the costs of building and operating the Heat Network and protects end users from future costs of decarbonising the network, as these capital costs will not be passed through to them. These costs are picked up by future connection charges and from grant funding where applicable.

Vattenfall have committed to maintain a priority services register for Vulnerable Customers, and use expanded eligibility criteria, going beyond minimum standards under the Heat Trust Scheme.

Vattenfall have committed to no back-billing of domestic Customers for amounts more than 12 months old where the failure to bill is their fault. In addition there is a commitment that Vulnerable Customers will never be disconnected during the winter heating season. Vulnerable Customers will also be provided with alternative Heat for any interruptions lasting longer than 12 hours. BHNL will adopt ability to pay principles and extended credit control process for domestic customers. The debt respite scheme known as 'Breathing Space' recently came into force, offering enhanced protection to individuals (domestic Customers) in debt crisis. Whilst the protections do not extend to the unregulated energy market, BHNL shall adopt the protections for our domestic Customers.

In the unlikely event of a supply failure, HRA would be entitled to standard compensation payments in line with Heat Trust guidance for bulk supplies. However, the possibility of an enhanced payment to allow the HRA to pass this on to tenants in the unlikely event of a disruption – much like if a resident with a normal gas supply experienced a disruption – is being discussed with Vattenfall. This would be a departure from normal bulk supply arrangements adopted across the rest of the network.

The table below shows the proposed Guaranteed Standards of Service (GSOS) for Domestic Customers. For Customers other than Domestic Customers, Vattenfall are to adopt the Standards of Service that already exist in the BHNL supply agreements.

Standard	KPI and guaranteed service payment if KPI is missed
Planned outage	<ul style="list-style-type: none"> • We will provide 5 days written notice. £10 one-off payment if 5 days’ notice is not provided. • £30 payment to eligible Customers if the outage exceeds 5 Business Days. Payment is for each 24-hour period outage continues from hour 24 on the fifth day to a cap of £500. • Vulnerable Customers are provided with alternative heating for outages that exceed 12 hours. If this is not met, a one-off payment of £24 will be paid by BHNL to affected Domestic Customers.
Unplanned outage	<ul style="list-style-type: none"> • We will restore Heat supply within 24 hours from notification of an unplanned outage that we are responsible for. If supply is not restored, £30 payment to eligible Customers for each full 24hr period off supply up to a cap of £500. • Vulnerable Customers are provided with alternative heating for outages that exceed 12 hours. If this is not met, a one-off payment of £24 will be paid to affected Domestic Customers.
Multiple outages	<ul style="list-style-type: none"> • If we record four or more unplanned interruptions during any 12-month period and each unplanned interruption exceeds 12 hours, the Domestic Customer is eligible to receive a one-off payment of £54.
Emergency	<ul style="list-style-type: none"> • We will respond to emergencies within 4 hours. Responding means BHNL will attend the development address. We will pay £10 to eligible Domestic Customers if the KPI is missed.
Fault (not an outage)	<ul style="list-style-type: none"> • We will begin fault response within 7 days of receipt of a report from a Domestic Customer. We will pay £10 to eligible Domestic Customers if the KPI is missed.
Missed appointment	<ul style="list-style-type: none"> • If we need to reschedule an appointment, we will provide 24 hours’ notice. We will pay £10 payment to eligible Domestic Customers if the KPI is missed.

Summary of assets being transferred

Name	Asset type	Network	Summary
Redcliffe Phase 1 heat network	DH Pipework	Redcliffe	District heating pipework installed as part of the Redcliffe Phase 1 heat network project
Broughton House Energy Centre	Energy Centre	Redcliffe	Energy Centre plant situated within the Broughton House plant room – comprising of a biomass boiler, peak and reserve gas boilers and associated ancillaries (thermal stores, pressurisation units etc) (HRA & BCC General Fund assets)
Canynge House Energy Centre	Energy Centre	Redcliffe	Energy Centre plant situated within the Canynge House plant room – comprising gas boilers and associated ancillaries (HRA asset)
Redcliffe social housing heat network	DH Pipework	Redcliffe	DH Pipework installed as part of the Social housing primary heat network – (HRA asset)
Redcliffe Phase 2 heat network	DH pipework	Redcliffe	DH Pipe installed as part of the HNIP funded Redcliffe heat network
100 Temple St Energy Centre	Energy Centre	Redcliffe	Energy centre plant situated within 100 Temple St Plant room comprising of 0.5Mwe Gas CHP, peak & reserve gas boilers
Temple Gate network	DH Pipework	Redcliffe	Network installed as part of Redcliffe Phase 1 – installed as part of Temple Circus major highway works
Old Market heat network	DH Pipework	Old Market	DH Pipework installed as part of the Old Market heat network (HNIP funded)
Castle Park Energy Centre	Energy Centre	Old Market	Permanent Energy Centre for Old Market heat network including 3MW Water Source Heat Pump and peak & reserve gas boilers.
Gardner Haskins Energy Centre	Energy Centre	Old Market	Interim gas boiler energy centre for the Old Market heat network
Building network connections	Substations	Old Market, Redcliffe	Substations and associated equipment to supply heat from the heat network to individual buildings
Temple Heat network	DH Pipework	Temple	Brocks Bridge, Cattle market Road crossing and Temple Island DH pipework