STOCKPORT
METROPOLITAN BOROUGH COUNCIL

Guidance for District Heating Feasibility

This Guidance document is designed to provide a structure for undertaking feasibility work when implementing Stockport's Core Strategy Policy SD-4: District Heating (Network Development Areas). Five case studies are available for locations in the Borough and can be downloaded free:

www.stockport.gov.uk/planningsustainabledevelopment - see Related Documents on the right of the page.

The first section summarises the Guidance steps providing a checklist of activity for undertaking district heating feasibility work. The main body of the Guidance provides the detailed processes required to inform district heating feasibility. There is a final section which deals with considerations for specific types of sites.

1. Summary of Guidance Steps

The table below presents a summary of the more comprehensive guidance notes relating to early stage district heating feasibility advice available in this Guidance document. The table shows a checklist of opportunities that should be explored when initially assessing the feasibility and viability of district heating for a development site.

This work draws on the guidance document produced by the Town & Country Planning Association: Community Energy - Urban Planning for a Low Carbon Future.

A summary checklist of district heating feasibility implementation is provided below.

Step	Consideration	Yes/No
1	Consider the range of drivers for developing district heating on the site, and prioritise drivers according to influence on development proposals	
2	Define a set of objectives for the development in relation to energy supply and carbon reduction	
3a	Collect key information relating to proposed development, including initial energy profiling	
3b	Collect key information relating to existing development/buildings including: building types, outline heat demands/energy profiles	
3c	Collect key information relating to site including: site conditions, fuel supply information and existing mapping data (GIS/energy maps)	
3d	Combine information collected in 3a – 3c to define site in terms of energy opportunities, with potential to add development to existing mapping data	
4a	Using data gathering in step 3, carry out an initial district heating technology study for the development – technical expertise potentially required at this stage	
4b	Use technology study to develop an effective energy option, relating to objectives outlined at step 2	

Step	Consideration	Yes/No
5a	Alongside district heating consideration, take into account the role of microgeneration technologies in meeting the objectives outlined at step 2 – technical expertise potentially required at this stage	
5b	Consider the financial benefits to microgeneration, in relation to financial incentives such as the Feed-in-Tariff and the Renewable Heat Incentive	
6a	Carry out full feasibility study using information and data gathered in steps 3 to 5, focusing on design principles and technical issues – technical expertise potentially required at this stage	
6b	Include as part of feasibility study consideration of: programmes of improvements to existing buildings; design targets; layout/phasing; size/scale; heat connections, future-proofing; financing/delivery; stakeholder engagement	
6c	Propose district heating solutions (or otherwise) that make explicit reference to thresholds and requirements of SMBC Policy SD-4	
6d	Where district heating feasibility is considered not initially feasible, demonstrate measures proposed for provision for future connection	

2. Step by Step Guidelines

This section provides detailed guidance on each of the Steps highlighted in the summary table.

General Guidelines

Step		Yes/No
1	Consider the range of drivers for developing district heating on the site and prioritise drivers according to influence on development proposals	

What is triggering the requirement for investigating the feasibility of a district heating network and why is district energy consideration important?

- Replacement of existing plant
- Refurbishment of existing building fabric
- New development proposals
- Public sector investment in district heating infrastructure
- Response to high energy use and/or costs, concerns about fuel security
- Easiest route to achieving building regulations / local planning policy targets

The type of development proposed will strongly influence key decisions relating to technology type, ownership, cost, energy sharing potential, future-proofing etc. A long-term perspective on energy generation/supply should be taken as soon as possible.

Have clear objectives been defined for the proposed development?

Step	Consideration	Yes/No
2	Define a set of objectives for the development in relation to energy supply and carbon reduction	

- Carbon reduction (relating to local/regional targets)
- Technical feasibility
- Financial viability (include potential income generation)
- Security of supply

Defining objectives will allow a framework to be set against which options and decisions can be reviewed. This will also demonstrate the beginning of the thought-process against which progress can be measured and show compliance with planning requirements. Commercial/financial drivers relating to energy are also of key importance. Income generation opportunities from the Renewable Heat Incentive or Feed in Tariff[1] should be factored into financial considerations at this stage.

Achieve an understanding of the development proposals and the setting within which development will take place.

Step	Consideration	Yes/No
3a	Collect key information relating to proposed development, including initial energy profiling	
3b	Collect key information relating to existing development/buildings including: building types, outline heat demands/energy profiles	
3c	Collect key information relating to site including: site conditions, fuel supply information and existing mapping data (Geographical Information Systems (GIS)/energy maps)	
3d	Combine information collected in 3a – 3c to define site in terms of energy opportunities, with potential to add development to existing mapping data	

- Development building type(s)
- Energy consumption/demand predictions (including cooling)
- Development density & phasing
- Existing site conditions
- Design approaches including orientation
- Outline energy profiles or heat demands of local buildings
- Outline knowledge of system types employed by local buildings
- Proximity of future development sites
- Proximity of existing anchor loads
- Local fuel sources and availability

Collection of data relating to the proposed development will be valuable for informing decisions about energy generation and distribution systems. At an early stage this can be carried out via a simple benchmarking exercise relating to the proposed development building types/floor areas or, where appropriate, through more detailed thermal modelling techniques.

1 http://www.fitariffs.co.uk/FITs/

An understanding of load profiles (and the effect of combining different building type profiles) is important for determining a base load against which energy strategies and technology options can be assessed.

Opportunities for energy/heat sharing with existing buildings near a site will largely be defined by the presence of buildings which have steady year-round heat loads called anchor loads. Buildings usually well-suited to this include public buildings, hospitals, hotels and leisure centres. These buildings (along with any site restrictions such as major roads, water-ways, railway lines etc.) should be incorporated into a high-level energy/heat map of the site, which can be used to quickly define the main local opportunities and constraints. Heat maps are also useful for assessing the local renewable energy resources available.

Stockport Council has already undertaken heat mapping at a Borough wide level which can inform any feasibility work planned for a site. The Energy Opportunities Plan can be found in Stockport's Core Strategy: www.stockport.gov.uk/services/environment/planningpolicy/ldf/dpd/corestrategy.

The Planning Policy Team at Stockport Council should be contacted for access to data, email planning.policy@stockport.gov.uk or telephone 0161 474 4395.

Information regarding the proposed development, the site opportunities / constraints and an energy / heat map should be used to review a series of renewable technologies options:

Step	Consideration	Yes/No
4a	Using data gathered in Step 3, carry out an initial district heating technology study for the development – technical expertise potentially required at this stage	
4b	Use technology study to develop an effective energy option, relating to objectives outlined at Step 2	

- Combined heat and power (either biomass or gas fuelled)
- Biomass heating
- Bio gas heating
- Geothermal heat
- Energy from waste

Several issues need to be considered regarding the suitability of different technologies for a particular development. A base-case (for example providing gas boilers) should be considered for comparison against energy, carbon and cost. This exercise requires a certain degree of knowledge and understanding of technical issues and may require input from technical experts[2].

Technology appraisals should include as a minimum:

- estimates of energy consumption and carbon emissions;
- indicative equipment sizing;
- consideration of technology location in relation to development;
- fuel availability/storage;
- phasing requirements (if required);

2 www.businesslink.gov.uk/bdotg/action/layer?topicId=1079422061

- indicative cost appraisal (including any financial incentives where appropriate);
- consideration of how a technology may contribute to regulatory/planning requirements.

This process should aim towards providing an effective energy option that aligns with the objectives described in Step 2 above.

Microgeneration technologies should also be considered at this stage

Step	Consideration	Yes/No
5a	Alongside district heating consideration, take into account the role of microgeneration technologies in meeting the objectives outlined at Step 2 – technical expertise potentially required at this stage	
5b	Consider the financial benefits of microgeneration in relation to financial incentives such as the Feed-in Tariff and the Renewable Heat Incentive	

- Solar Photovoltaics
- Solar water heating
- Hydropower
- Wind power
- Heat pumps

Where a district heating system may not initially be feasible, the use of microgeneration technologies should be considered as an additional way of meeting the objectives described in Step 2. At this stage this can involve a high-level approach, but should include site/building integration issues, an overview of energy, carbon and costs (including the role of financial incentives), as well as the potential contribution of appropriate technologies to regulatory/planning requirements.

The official information resource for the Feed in Tariff and Renewable Heat Incentive is currently the Energy Saving Trust[3], however there are a range of information resources available for commercial clients including the Carbon Trust[4].

District heating feasibility will involve a more detailed study into the design principles and technical issues of delivering decentralised energy, both at the development site and for sharing energy with surrounding areas

Step	Consideration	Yes/No
6a	Carry out full feasibility study using information and data gathered in Steps 3 to 5, focusing on design principles and technical issues – technical expertise potentially required at this stage	
6b	Include as part of feasibility study consideration of: programmes of improvements to existing buildings; design targets; layout/phasing; size/scale; heat connections, future-proofing measures; financing/delivery; local stakeholder engagement	

3 www.energysavingtrust.org.uk/

4 www.carbontrust.co.uk/cut-carbon-reduce-costs/products-services/Pages/buildings.aspx

6c	Propose district heating solutions (or otherwise) that make explicit reference to thresholds and requirements of Stockport's Core Strategy Policy SD-4	
6d	Where district heating feasibility is considered not initially feasible, demonstrate measures proposed for provision for future connection	

Condition of existing buildings

Scope may exist for considering a programme of improvement works alongside network development. Addressing issues with building fabric (for example, 'leaky' or poorly-insulated buildings) can help to maximise efficiency and ensure heat losses are minimal. This can often occur as part of refurbishment work such as programmed improvements to social housing.

Design targets for new buildings

New building development will introduce an energy and carbon burden to the area in which it is built. Such development should always aim to minimise its energy requirement through specification of stringent targets for design parameters such as insulation standards, air-tightness, glazing ratio etc. Guidance on acceptable building standards is available as part of Building Regulations' limits on design flexibility. Developers must consider these standards as minimum requirements and aim to exceed these limits where possible.

Layout and phasing

Consideration of layout is important not only in terms of achieving densities that are acceptable for district heating feasibility, but also with regards to infrastructure planning and making available opportunities for future connections. This should include a broad appreciation of where future development may occur[5] and some allowance for the additional infrastructure this may require. Typically this involves situating plant rooms adjacent to potential future pipe-routes and allowing space for building/network interface equipment (such as heat exchangers). Discussion with Stockport Council[6] will be necessary to fully understand any plans for district heating networks across the Borough.

For larger developments consideration of phasing can have a positive influence on where district heating equipment and infrastructure may be located. Further to this, the relationship between phasing and infrastructure can help to define optimal routes for pipe-work and future connection opportunities, thereby minimising distribution heat loss.

Development size and scale

When considering large-scale developments, Core Strategy Policy SD-4 is clear that heat network opportunities should be taken forward. However, the threshold presented in SD-4 recognises that heat network opportunities are often limited to development over a certain size. See Appendix 1 of this Guidance for detail of the policy and thresholds.

Furthermore, it is also recognised that smaller development should be considered integral to development of larger networks, where such connection opportunities exist. The connection of smaller development to wider

5 www.stockport.gov.uk/ldf

6 Email: Planning.policy@stockport.gov.uk Tel: 0161 474 4395

heat networks helps to balance the overall load requirement and reduce 'peaks' of demand. This principle is key in delivering efficient and robust decentralised energy at a district scale.

When considering 'small developments' it is important to develop an understanding of the opportunities offered by surrounding development in terms of energy sharing opportunities, as well as the options available for future-proofing. An energy/heat map is a good tool in such an instance as it offers a snap-shot of existing and potential future growth options and can suggest how a wider network may develop over time – Stockport's Energy Opportunities Plan is a borough-wide example[7].

Network connections

This issue is concerned with the physical connections required between buildings, dwellings, plant, energy centres and wider developments that may form part or all of a network and is important, both in cases where a network is initially feasible and where provision is made for a future connection.

Where heat or energy is being shared over a wider network beyond a development site (for example when exporting to, or importing from, an adjacent building), a more detailed understanding of the potential constraints related to connection plant will be required. This may involve preliminary dialogue with the building owners or occupiers considered for connection.

Although the technical principles of connecting new buildings or existing buildings to heat networks are similar, consideration should be given as to the potential constraints of retrofitting of heat exchangers / distribution system connections to existing buildings. An outline appreciation of the heat generation and distribution plant within existing buildings identified as potentially appropriate for more detailed appraisal can quickly help to give an idea of whether such a proposal is technically feasible and financially viable. In general, buildings where electric heating is present are more costly to retrofit compared to those where existing wet systems (or, preferably, some form of community heating) exist.

For 'small' developments the type and location of plant installed for future network connection should consider the amount of heat required upon completion of the development (as per Step 3 above) and any future on-site expansion (i.e. extensions for addition of usable space).

Future-proofing measures

Application of future-proofing measures will more often than not (but not exclusively), apply to developments that fall under the threshold presented by Core Policy SD-4 – see Appendix 1. Concerns have been expressed that future-proofing measures are expensive and (in some cases) will ultimately not be taken advantage of in the short to medium term, however this section of the Guidance aims to clarify this issue. **Where the SD-4 threshold for development is not met, the following guidance is particularly relevant and should be followed – see Appendix 1 to this document.**

Connection to a district heating network offers several short and long term benefits for building owners, building occupants and general development within the immediate area. These include:

- Reductions in CO_2 emissions through the use of renewable systems that may only be viable at a large scale, or use of energy which would otherwise be wasted in power generation

7 http://stockport-consult.limehouse.co.uk/portal/pp/zzz_adopteddocuments/corestrategy?pointId=1296729003174#section-1296729003174

- Potential increase in energy generation efficiency using large scale plant
- Potential economies of scale associated with a larger scale plant compared to a large number of smaller individual systems
- Reduction in overall maintenance costs
- Use of a range of efficient / low carbon technologies to meet heat demand
- Renewable energy can be provided to users for which other on-site low carbon options may not be viable
- Opportunities for future buildings to connect to a low carbon network to help meet stringent future carbon reduction targets
- Opportunities to influence the CO_2 emissions associated with a number of buildings/dwellings through replacement of a single plant item (as opposed to a replacement program for a large number of individual heating systems)
- Modern metering and control systems mean that energy usage can be measured accurately at each point of use and users/consumers billed accurately.

If these benefits cannot be initially taken advantage of it is in the interest of the developer to understand how the proposed buildings may be designed or refurbished in a way that does not preclude future connection and missing out on these benefits. Equally, it is recognised that different development plots may require or be limited to different degrees of future-proofing measures depending on issues relating to the site. Further guidance is available from Stockport Council regarding wider district heating development/expansion throughout the Borough.

In these instances a hierarchical approach should be taken forward, whereby the level of future-proofing/connectivity measures required will be determined based upon both the scale of the heat demand at the proposed development and the location of the proposed development relative to proposed future network expansion routes. In these cases, a dialogue should be carried out between the developer and Stockport Council to determine a clear idea of heat networks planned in/around Stockport as well as where and when these networks are likely to develop.

The Table 'District Heating Future Proofing Levels' overleaf provides a staged approach for delivering development which falls below the SD4 policy threshold but requires futureproofing of the development with regards to district heating implementation. You will need to discuss this approach and the requirements for your site with the Planning Department at Stockport Council as early in your design as possible.

The options provide a range of future-proofing measures that all give some degree of future capability of connection to a network. These measures offer a range of cost options that (in the case of 2 and 3) often add very little extra cost to development over and above more traditional heating systems, yet still demonstrate a degree of commitment to future-proofing.

In rare cases where plant may need to be superseded upon connection it will not necessarily imply redundancy of plant or investment. The plant may be maintained as standby by the network operator (depending on plant size) or, as is the case in cities such as Sheffield, the building owner may be incentivised by paying a lower connection charge (for a new heat exchanger unit) or a lower on-going capacity charge.

District Heating Future Proofing Levels

Future Connectivity Potential	Future Proofing measures required	Capital cost increase
1 – No connectivity	**Residential** – No measures required **Commercial** – No measures required	Zero
2 – Low connectivity	**Residential** – wet heating system installed, space allowance made in risers and across floor plates/roof voids to accommodate hot water system, space allowance in plant for heat exchangers, trench installed from building to where future district heating network is likely to occur **Commercial** – wet heating system installed, capped off headers on flow / return pipe-work, plastic sleeves (or removable panel) through foundations to allow future connection	Low
3 – Medium connectivity	**Residential** – Installation of communal heating system, space allowance for heat exchanger unit in plant room, trench installed from building to where future district heating network is likely to occur **Commercial** – capped off headers on flow / return pipe-work, plastic sleeves (or removable panel) through foundations to allow future connection, design of future energy centre as close to proposed future network route as possible, use of CHP if appropriate	Medium
4 – High connectivity	Installation of district heating pipe-work across site, installation of single energy centre (where multiple buildings / apartment blocks occur), energy centre location close to proposed future network route will occur	High

Financing and delivery

The motivations/requirements for each site should be identified – e.g. cost effective Part L compliance, tackling fuel poverty, differentiating new property. For networks the potential relationships between different stakeholders should be identified and this should then inform further data collection e.g. types of heating system, when plant may require replacing.

Developer-led network opportunities could be supported via a framework arrangement by choosing pre-selected Energy Services Company (ESCo) partners[8] – these could be selected under a number of specialist categories based on their track record/capabilities. Resident-owned ESCo structures could be promoted for apartment schemes, particularly for large mill refurbishments, with financing/engineering potentially procured through the proposed framework arrangement.

Investment routes for micro-generation and medium to large scale wind turbines should also be considered alongside network investment requirements, including the potential to use surpluses to cross-subsidise retrofitting.

8 www.tcpa.org.uk/data/files/ceg.pdf - see pages 28-30 on Energy Services Companies

Local engagement issues

Development of a heat network into a wider area will require a degree of engagement with local organisations and building owners/occupiers, especially where potential anchor loads are considered. This may involve more expansive discussion regarding the potential benefits of district heating (through forums and workshops), not only in terms of general principles, but also for demonstrating local benefits to local users. Stockport Council support will be valuable in the context of the wider ambitions of delivering decentralised heat throughout Stockport.

Developers may want to consider how district heating may deliver benefits not only to the development itself (environmentally and economically), but to the wider community. Understanding these issues will help to engage a wide range of individuals and groups including developers, planners, design teams, local businesses, local residents etc. These benefits will often include: carbon reductions; fuel flexibility and security of supply; reduced fuel bills for building occupiers (especially relevant where fuel poverty exists); assisting of delivery of sustainable development; compliance with policy requirements; demonstration of corporate social responsibility.

There is an associated need to consider marketing skills and knowledge to make the most of marketing this opportunity to building owners and occupants. Whilst there is no specific training available, refer to Stockport's Sustainable Design & Construction SPD which offers some information on marketing approaches[9].

'Site type' specific guidelines

It is recognised that different opportunities will exist at different sites, dependant on many factors, including building mix, new build/refurbishment proportion, etc. The issues described in Steps 1 to 6 are applicable and relevant to most sites and should be considered whenever compliance with the requirements of policy SD-4 is to be investigated.

The following notes highlight some 'site type' specific issues that should also be considered where such development exists. These site types reflect typical development types throughout Stockport.

1. **Low Density Residential Development**

The density of development will largely define the extent of opportunities for district heating feasibility. In general, a density of more than 50 dwellings per hectare, or a development scale of greater than 400 dwellings (for low density residential) could be used as rules of thumb for initial district heating potential. This rule of thumb should be considered in addition to the guidance outlined in policy SD-4, with the requirements of that policy guidance taking precedence.

General urban design guidance principles can be used to increase the density of development, thereby increasing the potential for district heating and reducing infrastructure requirements. This guidance can be sought through employing urban designers or network engineers as part of a design team.

1. **Mixed-use Retail Park Commercial Development**

When dealing with high proportions of commercial development, cooling loads should be considered alongside a wider heat network. A high-level assessment of the cooling demands of a particular site (as well as

9 www.stockport.gov.uk/planningsustainabledevelopment

those of the wider area) should be carried out to help understand whether a decentralised cooling solution may be appropriate.

If this proves to be the case, a more technical assessment of methods/technologies for integrating heating and cooling demands may be required to attempt to maximise the opportunity for energy sharing. This could include considerations of the use of technologies such as absorption chillers, heat pumps (which can provide simultaneous heating and cooling), as well as energy solutions such as water-loop heat pump networks. Some of these solutions will require a good 'balance' of heating and cooling loads, so may not be appropriate in every case.

Microgeneration technologies are likely to be particularly appropriate where buildings have large cooling and electricity demands, so should be considered as ways of offsetting these demands and diversifying the energy mix. A high-level appraisal of the financial incentives available for such technologies will help to deliver a strong business case for their inclusion.

2. **Regeneration Residential**

Regeneration projects inevitably deliver opportunities for improving local buildings and infrastructure, so heat network considerations should include an appraisal of building level energy efficiency improvements. Such improvements can complement optimisation of district heating opportunities in terms of improving efficiency of heat generation and are an important part of improving the availability of quality buildings in Stockport.

Opportunities for 'creating' anchor load buildings should also be explored, for example refurbishment of high-rise apartment blocks as part of a more general approach to estate remodelling. This should include consultation with SMBC and Stockport Homes as well as other social landlords, as opportunities are likely to exist in the sphere of social housing.

3. **Mill Development**

Stockport has a large number of mill buildings requiring development – in most cases these buildings will require a co-ordinated programme of improvement works before energy supply/generation can be considered. Refurbishment works should follow guidance as per Building Regulations Approved Documents L1B (existing dwellings) and L2B (existing buildings other than dwellings).

Consideration should also be given to any carbon reduction targets (at national, regional and local level) and how refurbishment works may contribute to these targets. This can be estimated based upon existing energy consumption data or benchmark improvement figures, or through use of energy modelling techniques if a more detailed analysis is required. Cost considerations should be taken into account as mill buildings can be difficult to improve to modern standards of energy efficiency.

Mill buildings can also employ a variety of existing retrofitted heating system types – it is important to determine what these are, and how further development of a mill building may generate and distribute heat, both within the mill itself, and potentially to the wider development area. Discussion with mill building owners/occupiers can inform how a building is currently used, and what any issues are. There may be technology compatibility issues when considering heating system retrofit measures.

Ancillary structures such as engine-houses are often found in mill buildings, which can be ideal for housing replacement plant or as space put aside for fuel or heat storage. Considering this may increase the available development floor space in the mill building itself.

The large roof areas associated with mill buildings can offer opportunities for microgeneration – this should be considered in all cases, i.e. where connection to a heat network either is, or is not, available, or where development of a heat network is not initially feasible. This will provide a good way of diversifying the energy mix, benefiting from energy generation financial incentives, increasing robustness of available energy sources and contributing to local carbon reduction targets.

Appendix 1

Core Strategy Policy SD-4 District Heating (Network Development Areas)

The following is a partial copy of the District Heating policy specifically showing the thresholds for development requirements with regards to district heating.

The Council is keen to take advantage of opportunities to install district heating across the Borough. New development in 'Network Development Areas', where technically feasible and financially viable, should contribute to this objective by considering district heating for meeting the requirements of Core Policy CS1 'OVERARCHING PRINCIPLES: SUSTAINABLE DEVELOPMENT - ADDRESSING INEQUALITIES AND CLIMATE CHANGE'. The Council recognises that different development types will have different opportunities, therefore:

1. All developments should seek to make use of available heat, biomass and waste heat.
2. Small developments (less than 100 dwellings or non-residential developments less than 10,000m2) should connect to any available district heating networks. Where a district heating network does not yet exist, applicants should install heating and cooling equipment that is capable of connection at a later date and which could serve (or could be easily adapted to serve) that wider network if and when required.
3. Large and mixed-use developments (over 100 dwellings or non-residential developments over 10,000m2) should install a district heating network to serve the site. The council's ambition is to develop strategic area wide networks and so the design and layout of site-wide networks should be such as to enable future expansion into surrounding communities. Where appropriate, applicants may be required to provide land, buildings and/or equipment for an energy centre to serve existing or new development.
4. New development should be designed to maximise the opportunities to accommodate a district heating solution, considering: density, mix of use, layout and phasing.
5. Where investment or development is being undertaken into or adjacent to a public building, full consideration should be given to the potential role that the public building can have in providing an anchor load within a decentralised energy network.

Criteria that have been used to define the Network Development Areas are set out below.

New development:

- Residential development of at least 55 dwellings per hectare and at least 100 dwellings
- Large scale mixed use development – enables good anchor load
- Proximity to high heat density areas of existing buildings – enables extension into existing development
- Proximity to existing heat sources

Existing development:

- Heat demand density of at least 3,000kW/km2 and residential density of at least 55 dwellings per hectare or presence of a public sector building to provide a good anchor load
- Proximity to sources of heat (e.g. industrial processes) – enables zero carbon energy source