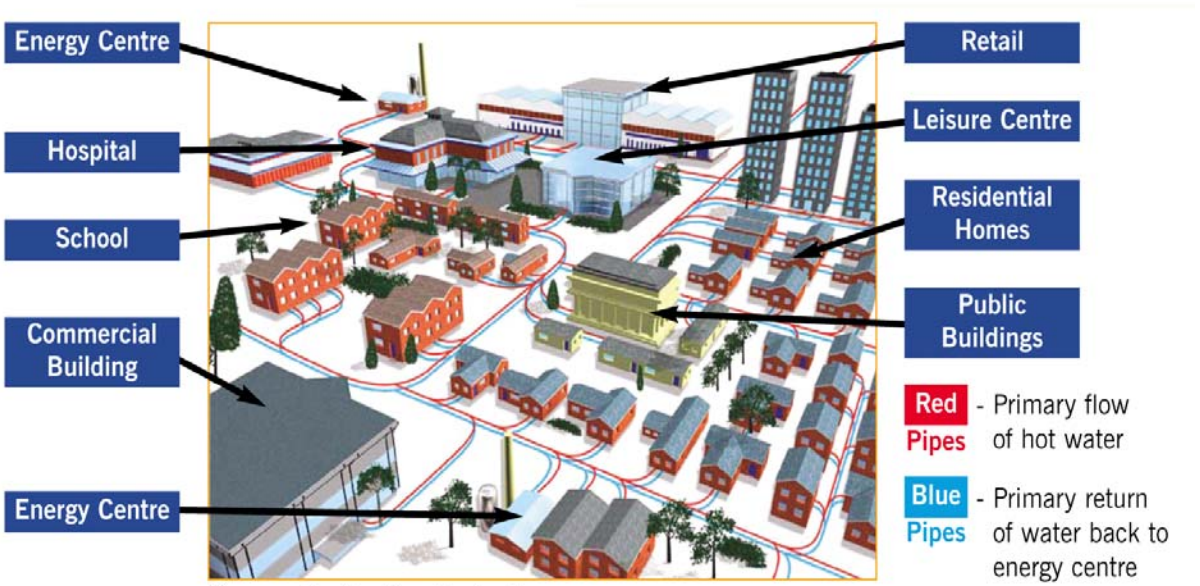
An introduction to District Heating

What is District Heating?

District heating systems provide multiple buildings or dwellings with heat and hot water from a central boiler house, or 'energy centre'. The system can provide heating or cooling which is transferred from the energy centre through a network of highly insulated pipes carrying the water to each building. Every building or apartment has a heat exchange unit including a heat meter to monitor how much heat is used.

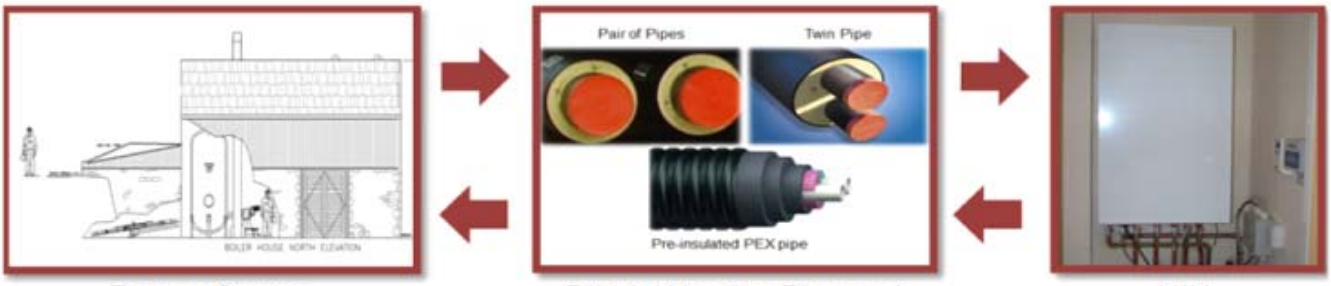


Community Heating Illustration

Depending on the size and density of the network, there are a number of different energy sources that can be used for district heating, including biomass, geothermal heat, energy from waste, solar systems, heat pumps, waste heat from industrial processes, in addition to conventional boilers and cogeneration.

In most cases a mix of energy use with a high density demand is helpful in justifying the installation of a district heating scheme. If a scheme is not connected to the natural gas grid the carbon and cost savings can be significant.

Main Components of a District Heating System



Energy Centre | District Heating Pipework | HIU

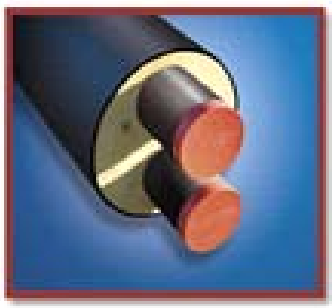
Energy is transferred from the energy centre via the district heating pipework, then through two plate heat exchangers housed within the Hydraulic Interface Unit (HIU). The HIU is the equivalent of a domestic combination boiler, providing heat energy to the secondary circuits, domestic hot water & heating within the house.

District Heating Pipework

District heating pipework is critical to the success of a system and, depending on the scale of the heat network, is usually the most expensive element of any scheme. It can account for around a third of the overall scheme cost. Pipework can vary in the material of construction and its thermal insulation properties, with heat loss from a district heating scheme between 5-20% on an annual basis. To support the maintenance of the system, leak monitoring systems can be installed to detect any issues at an early stage.

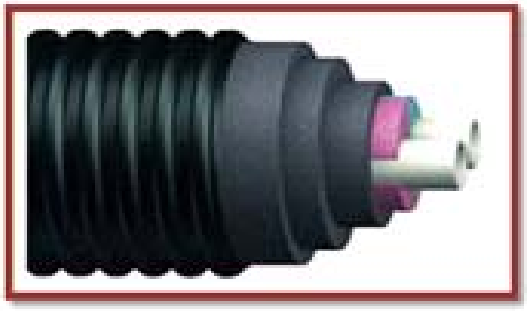
There are two main types of piping:

- ***Plastic piping*** - this is cheaper to install and can be used in areas where there are difficult ground conditions, due to its flexibility in comparison to the steel system;
- ***Steel piping*** – this is more commonly used for the larger commercial systems due to its strength and durability.



Twin Steel Pipe

Single Steel Pipe



Twin Plastic Pipe

Other issues that need considering are the insulation thickness around the pipes and the size of the trench needed to bury the pipes, which can affect construction costs.
Heat loss needs to be considered during a scheme's operation as it can affect the scheme's energy output. Heat loss can be affected by a number of factors, such as the length of the pipework in relation to the heat load, the standard of insulation, and the supply temperature. For example, in summer months it is important to reduce the supply temperature when the demand for space heating reduces, in order to reduce heat losses through the pipe network and optimise energy and carbon savings.

Advantages of district heating

Compared to owning and operating an on-site boiler, conversion to district heating can benefit the user in a number of ways:-

- Energy Cost - the ability to generate heat at low costs means district heating can contribute to the goal of reducing fuel poverty.
- Reliability - systems are built with stand-by heating capacity to ensure that heat is always available.
- Tenant Comfort - hot water district heating provides even heating that is easily controlled, particularly when compared to older heating systems.
- Reduced Investment - In a new building, the owner avoids the cost of purchasing a boiler and associated facilities such as a flue.
- Energy Efficiency - Conversion to district heating can result in substantial energy savings. The user pays only for the heat that is actually used.
- Domestic hot water can be generated instantaneously through a dedicated heat exchanger, saving the losses incurred with storage and eliminating the time delay in regeneration.

Disadvantages of district heating

- If you have an electric heating system or no central heating you will need to install a wet system (radiator or underfloor piping).

- Upheaval of laying the district heating pipes, although routes to minimise disturbance are available in most cases.
- A reasonable amount of space is required for the central energy centre including fuel storage.
- Having to cross physical barriers, such as railways, major highways and waterways, can make district heating pipe work much more expensive and introduce delays in construction.

Planning Considerations

The installation of any district heating system within a new development, or as part of a retrofit scheme, would constitute an engineering operation for which full planning permission would be required.

Building level

Construction of a separate boiler house, fuel store (if required) and flue is likely to require planning permission.

Community and large industrial

Planning permission is required for the pipes, boiler houses and flues. If the network is to be developed by an organisation able to exercise powers of a Statutory District Heating Undertaking (that is, the city council or a holder of an electricity supply licence stipulating district heating) this will permit them to lay mains in the public highway. However, it would not exempt them from the need to apply for planning permission.

The practicalities of installation are often hindered by the requirement for input from multiple developers; therefore, extensive pre-application consultation and engagement is required. It is advised that full details of the proposed scheme be forwarded to the Local Planning Authority (LPA) for their consideration in each instance due to the variability in each scheme.

Policy

Planning Policy Statement 1- Delivering Sustainable Development, outlines the requirement for local authorities to promote resource and energy efficient buildings, with community heating schemes and the use of combined heat and power systems identified as holding significant potential in achieving this requirement.
The Household Energy Management Strategy was published on 2 March 2010. It placed a greater emphasis on district heating schemes and identified an essential role for planning in facilitating delivery of these and other community scale energy schemes. In this regard, planners should actively encourage the procurement of these systems within larger scale developments, residential, commercial and mixed use developments.

Local Case Studies

Case Study – 'The Village' Accommodation at Newton Rigg, University of Cumbria, Penrith

(Information courtesy of Barden Energy Ltd)

The University decided to install a 300kW biomass boiler for its student accommodation.

The project comprises of a series of detached residential blocks, which are connected by a district heating network of underground pipes from the energy centre. The scheme is expected to burn around 300 tons of wood a year.

- Capital Cost £300,000
- Carbon Saving per year 230 tonnes
- Fuel Savings per year £40,000

Biomass Energy Centre Building and fuel store

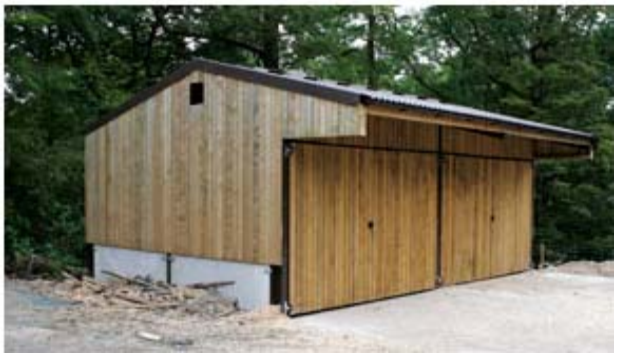
Case Study – Langdale Estate – Hotel and Country Club, Great Langdale, Cumbria

(Information courtesy of Barden Energy Ltd)

The Langdale Estate decided to install a Hertz Biomatic 250 KW boiler in 2008 to replace four LPG boilers. The boiler heats the main building, housing a leisure club and large swimming pool. It also heats a variety of other rooms such as the restaurant, bar and some guest accommodation.

Barden Energy Ltd were contracted to design and install the project and supply Langdale with woodchip. Using nine tonnes of woodchip a week, the new boiler offers tremendous energy savings of £150 a day. Langdale used to consume 200 tons of LPG a year.

- Capital Cost £130,000
- Carbon Saving per year 240 tonnes
- Fuel Savings per year £35,000



Wood chip storage building

BioMatic 250kW boiler

Visit case studies like this during the annual Cumbria Green Build Festival.

For case study information from across the North West visit the Climate Change North West online map.
http://www.climatechangenorthwest.co.uk/northwest-map.html

Where can I find out more information?

Energy Saving Trust 0800 512 012 www.energysavingtrust.org.uk Information, advice and guidance	Cumbria Action for Sustainability 01768 210276 www.cumbriagreenbuild.org.uk Local suppliers, events and training, case studies
Department for Energy and Climate Change www.decc.gov.uk	District Heating Companies Barden Energy Ltd Tel: 01539 566073 Vital Energi Ltd Tel: 01254 296000 Econergy Tel: 08700 545554
International Energy Agency www.iea-dhc.org International research and case studies	

Other useful UK case studies

Southampton district energy scheme www.greenpeace.org.uk/climate/case-study-southampton
Sheffield district heating scheme www.chpa.co.uk/chp-with-district-heating_187.html
Kielder district heating scheme www.northumberlandnationalpark.org.uk/casestudykielderheatingscheme

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