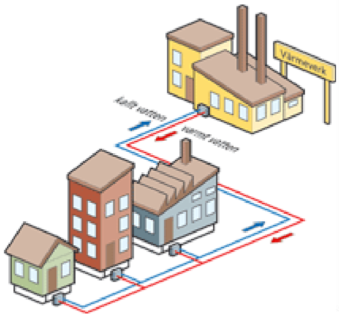
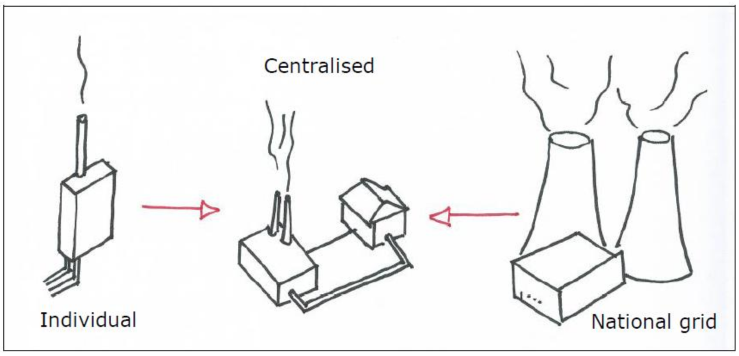
Planners' reference guide no. 14: District heating





Introduction

District heating is an alternative approach to delivering energy through the use of distributed hot water via underground pipes to meet the heating demands of a number of buildings. Heat networks essentially consists of some form of central heat generation plant (this could be biomass, CHP, waste heat from industrial processes or other heat sources), transmission and distribution heat mains in the ground, heat exchangers & heat meters and a wet heating system within each building.

District heating can be an attractive option under the right circumstances with a number of potential benefits:

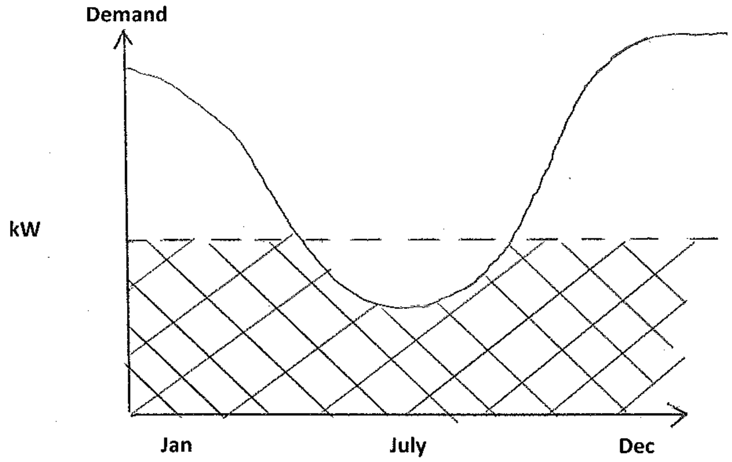
- Allows waste heat to be recovered locally rather than dumped as is common practice at electrical power stations
- Reduction in carbon emissions
- Larger scale plant can operate more efficiently
- Economies of scale
- Greater fuel purchasing power
- Maintenance cost associated with plant will be reduced
- Increased usable space in buildings
- Single piece of equipment determines CO_2 for multiple end users
- Demonstrated to offer the highest levels of carbon savings under the domestic zero carbon consultation

System sizes

District energy networks can vary in size from just a small number of buildings to whole towns and cities. In the UK, there are a number of apartment blocks that use a shared boiler system to supply heat to each individual unit, but there are only a small number of examples of larger schemes. In mainland Europe, however, there is a much greater take-up with a number of whole towns and cities being connecting onto a single district energy network. In Denmark, transmission heat mains exist that transmit heat over several kilometres from the point of generation to the point of end use, with only a small loss in heat due to high insulation properties of the pipework.

The use of low carbon technologies in supplying district energy networks is appealing due to the increased stability of heat demands through connecting multiple users. This benefit creates an ideal platform for the use of low carbon technologies to meet the base load and reduce carbon emissions, while providing a low cost means of heat generation. The most common system types to meet base load demand are biomass heating or gas CHP, but other technologies can also be considered, particularly at a larger scale.

An example of how a low carbon technology can be used to meet the base load demand is shown below:



Dimensions

The physical space required for a district energy network is largely dependent upon the number and size of buildings being served by the heating plant. In general, the heating plant itself is no larger than a conventional plant room of equivalent heat output and overall space savings can be made compared to a larger number of smaller plant rooms (e.g. 10no. 100kW boilers occupies a larger area than 1no. 1MW boiler).

The transmission and distribution pipes themselves are usually positioned in trenches in the ground and so there is no additional space required for this, however consideration must be given to the routing of pipework and impacts on other existing infrastructure. The pipework typically has a diameter of between 100-500mm depending upon the capacity of heat required to be distributed. It must be considered that both a flow and return pipe are required to be placed into the ground.

An example of the underground pipes is shown below:

Rules of thumb and costs

- Costs (as at June 2011 – please note this is a rough guide only)
  - Plant
    - Gas boilers: £50-£150/kW_{th}
    - Gas CHP: £500-£1,500/ kW_{th}
    - Biomass heating: £350-£800/ kW_{th}
    - Biomass CHP: £2,000-£4,000/ kW_{th}
  - Network infrastructure
    - Typical pipe diameters in the range of 100-500mm diameter (100kW – 100MW), £500-£5,000/m length
    - Heat Interface Unit (HIU) and meter, Approx £2,000/dwelling
  - Typical network sizes:
    - – 200 townhouses: 1-3 MW_{th}
    - – Hospital: 10-50 MW_{th}.

Planning considerations

The main planning considerations revolve around a suitable site for the energy centre. The specific considerations associated with this will be dependent upon the type of fuel and technology being used (e.g. whether biomass storage and delivery access is required). In general terms, energy centres should be located relatively centrally within the area that they serve (to minimise pipework costs) but must also be sensitively positioned to ensure that the character of development isn't destroyed and also to ensure compliance with local emissions regulations.

Energy centres have been disguised as part of 'feature buildings' or imitation buildings (such as garages or even house-shaped energy centres) to reduce their impact on the surrounding landscape.

Further Information

Planning for Renewable Energy: A Companion Guide to PPS22 - http://www.communities.gov.uk/publications/planningandbuilding/planningrenewable

CHP Association –

http://www.chpa.co.uk/

UK District Energy Association –

http://www.ukdea.org.uk/

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