Exercise 1: Energy Masterplanning for District Heating

Information on an example Decentralised Energy opportunity area is set out below. A plan showing key potential existing and future heat loads and cluster zones is attached.

The Task

- Read through the information below.
- Consider the cluster on the map and think about the different existing buildings and new development sites. Decide on which buildings and sites look like they have good potential to connect to a district heating network.
- Choose a location for an energy centre for that cluster i.e. the site for a CHP engine which will provide the hot water to run the district heating network.
- Draw lines from the energy centre location to the buildings or sites in your cluster which could connect. Decide :
    - the order/ phasing in which the buildings will be able to connect, and
    - the shortest/easiest route to connect them.

- Your facilitator will provide an indication of the cost of your network
- If you have time now discuss what planning policies and development management practices would be appropriate to secure the delivery of this network.

Which buildings would be suitable to connect?

Among the key factors which affect the viability of schemes are:

- Scheme heat density – urban areas or co-located industrial facilities tend to be better suited than suburban or rural locations.
- Load diversity (e.g. mix of uses) – a range of building types will smooth out the pattern of use through the day and over the year, helping to avoid extra plant which is used only occasionally to meet peak demands.
- Presence of anchor loads – a single large user located close to an energy centre can help initiate the network; further connections become more viable as the marginal cost of extending the network is lower than the start up cost.
- Scheme development costs – long pipe routes and "hard dig" routes (i.e. in the street) tend to increase costs. On the other hand laying pipe networks in the street is usually more convenient and avoids delays and expenses associated with acquiring easements or other rights across private land.
- Avoided building energy system costs – connecting existing buildings can be more expensive, but if timed to coincide with a major plant replacement cycle, the avoided costs for the building owner can be used to fund the district heating connection.

- Scheme operating costs – a single centralised plant is generally more cost effective than multiple smaller energy centres. However, some schemes start with multiple stand-alone networks, each with an energy centre

Different building types have different use profiles for heat. Buildings which are typically attractive for connection include:

- industrial developments with process heat demand (e.g. refining or sterilising) – however in some cases industrial applications require high temperature heat supplied as steam, which would not be appropriate for typical urban district heating uses
- existing buildings with thermal performance below current standards – as long as they have a centralised wet heating system
- leisure centres and swimming pools
- hospitals, prisons and other residential institutions
- campus developments

Buildings which can be attractive at a large enough scale, or when combined with a mix of buildings include:

- high and medium rise residential and hotels
- high rise offices – however many offices have a large cooling demand rather than heating demand
- large college and school buildings

Where is a suitable location for an energy centre?

The ideal location for the new energy centre will depend on a number of factors, including:

- ;
- proximity to major heat loads;
- fuel supply convenience; depending on the fuel type (i.e. gas or a solid fuel), this might be a location near a major gas transmission route, connected to rail sidings, attached to a wharf or near the trunk road network;
- proximity to electricity connection infrastructure, i.e. located near a major substation or feeder station;
- local environmental issues such as proximity to residential or other sensitive areas; and

How do you draw pipe routes?

Drawing pipe routes is, at the start, simply a matter of finding the shortest/easiest route between the energy centre and the buildings to be supplied. You can start by drawing wide corridors from your energy centre to your cluster. From there you can fill in more detailed connections from the main transmission corridor to individual

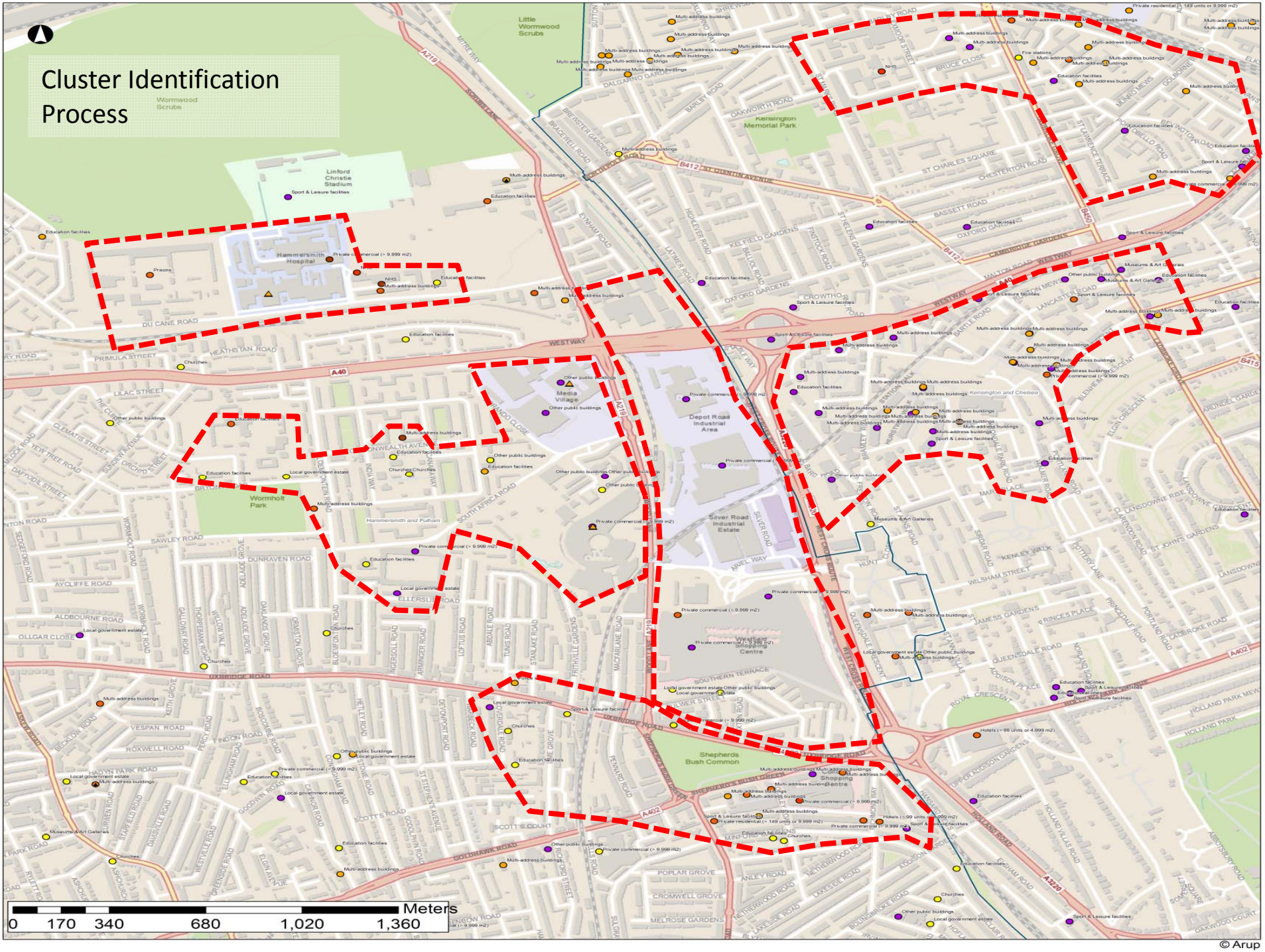
sites or smaller clusters. The lines should be informed by awareness of constraints and opportunities but need not be very detailed at this stage. Keeping the route options simple will allow you to draw different options quickly.

When drawing routes you should keep the following key principles in mind:

- cross soft ground where this choice is available. This can work out at a lower cost even where the soft dig route is somewhat longer than the hard dig route (up to a point);
- follow roads or other linear corridors such as cycle paths, waterways and green corridors; rail lines are also possible but more difficult to achieve in practice due to obtaining permissions from the railway undertaker;
- minimise number of bends and changes of direction in the network;
- avoid crossing major trunk roads and seek to place pipe routes along side roads where possible in preference to routes along trunk roads.
- avoid railway, waterway and dual carriageway crossings, where possible

How much does the infrastructure cost?

Costs can vary greatly depending on the size of the pipes, the complexity of the route and the size of the energy centre. Pipe routes installed on their own can range from £1,000 to £3,500 per linear metre, although when part of a wider works programme the costs can be reduced significantly. A simple rule of thumb for a gas CHP energy centre is £500,000 per megawatt installed capacity plus £1,500,000 fix cost for pumps, electrical equipment, heat plate exchangers and other equipment.


Cluster Identification Process
Meters
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