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Development of Heating and Cooling Strategy at Local Level

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What is CHP?

CHP Schemes generate electricity and at the same time recover the majority of the heat and put it to good use"

- In a CHP application heat is recovered, unlike power station heat is rejected to atmosphere
- Designed mainly to provide on site heat/Cooling and electricity/power needs

Large CHP,
up to 80%
efficiency

Small CHP,
up to 85%
efficiency

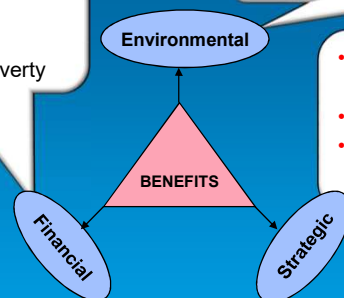
Power Station,
35-40%
efficiency

Benefits of CHP?

- Provide savings on both capital and operational expenditure
- Cost effective option
- Help alleviate fuel poverty

- reduce CO2 emissions by up to 30%
- reduce primary fuel use by up to 25%

- Reduce the need for additional power stations
- Contribute to security of supply
- Help meet environmental targets



Why do you need to know about CHP/District Heating/Cooling?

- To give due consideration to CHP/DHC at planning stages – the point where it can make the greatest difference
- To make sure development of CHP/DHC is considered as an essential part of waste procurement projects
- As CHP/DH can help achieve targets towards reducing **operational costs**
- also help reduce Carbon Emissions, helping to meet the **renewable and environmental agendas and maintain/improve organisation reputation**

Flexible fuels

Conventional Fuels:

- Natural Gas
- Fuel Oil
- Coal

Alternative Fuels:

- Biogas
- Liquid Biofuels
- Liquid Waste
- Biomass
- Solid Waste (% of Biomass)



Flexible technologies

Established Technologies:

- Steam Turbines
- Gas turbine
- Combined cycle gas turbine
- Reciprocating Engines
- Organic Rankine Engines

Emerging Technologies:

- AD with Reciprocating Engines
- Standard Gasification with Steam Turbines
- Advanced Gasification with Engines
- Pyrolysis with Engines

Heat/Cooling and Power options

Heating and cooling

- Hot Water
- Hot Air
- Steam (low and high pressure)
- Direct drying
- Cooling via Absorption Chillers

Power

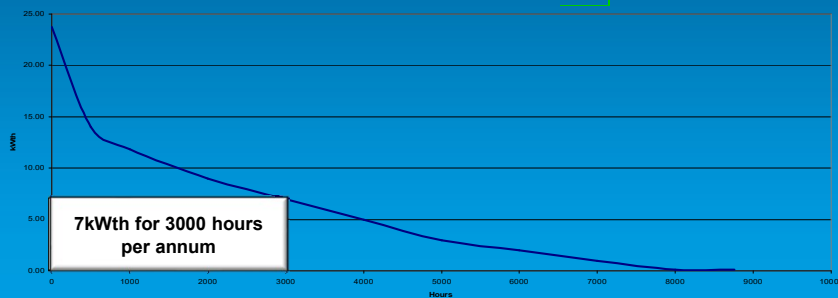
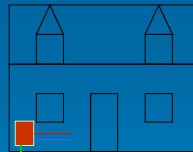
- Electrical
- Direct drive

CHP – Applications

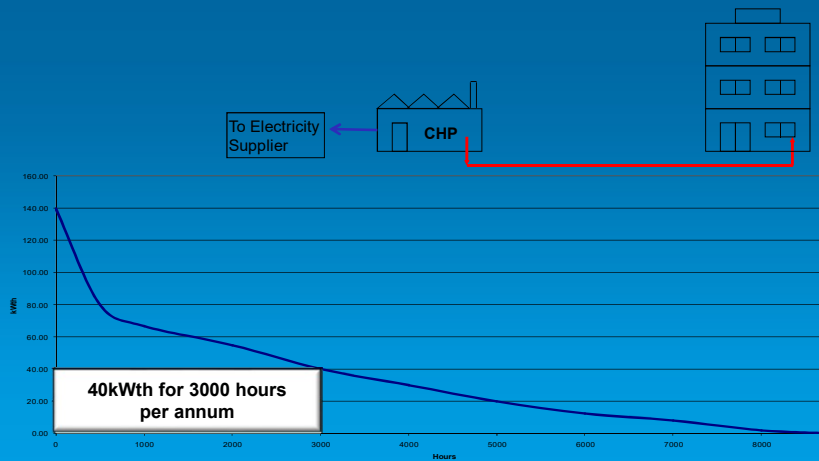
Available in different sizes from 1 kWe (domestic) to 100s of MWe (large refineries)

- **Industrial (all sectors...Chemicals, Refineries, Food & Drink, etc)**
- **Buildings**
 - Hospitals
 - Universities
 - Leisure Centres
 - **Hotels**
 - Commercial Buildings
- **Community/District Heating/Cooling**
 - Small community schemes (Residential buildings)
 - **Medium community schemes (mixed public, commercial and residential buildings)**
 - City Wide DHC Schemes

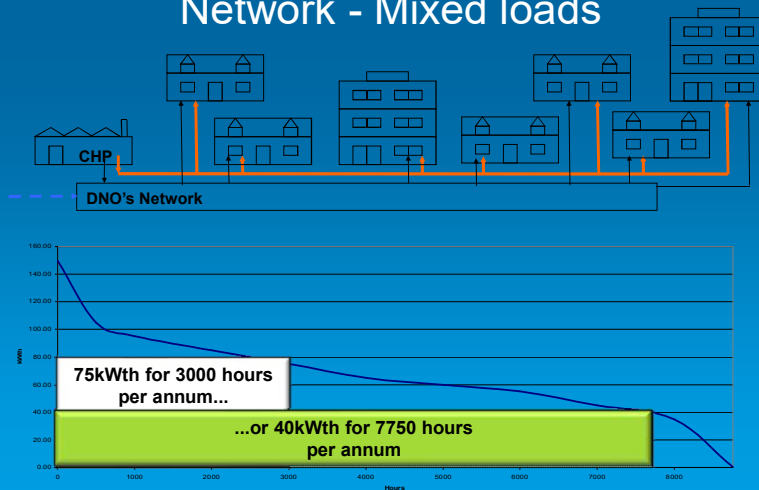
Heat Loads – Domestic CHP



Heat Loads – Simple Community Heating

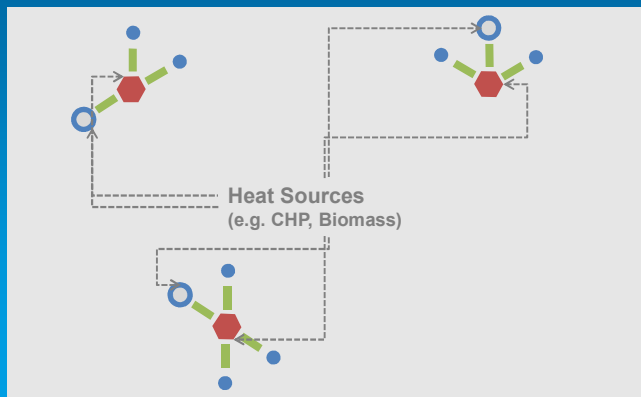


Heat Loads – District Heating/Cooling Network - Mixed loads



DH Network Development

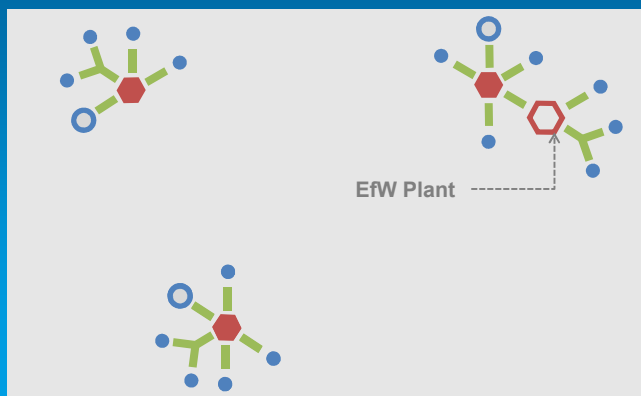
Stage 1 – Initial Development



One or more independent cluster networks developed based around key “anchor” loads (e.g. social housing, hospitals, universities etc.) and other loads in the vicinity. Each cluster served by a single, small heat source (e.g. gas CHP, EfW plant, etc)

DH Network Development

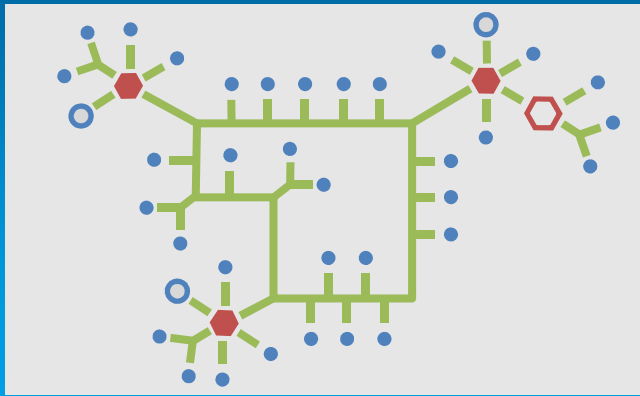
Stage 2 – Expansion



Clusters expand as they become more established to connect additional loads that have become economically viable. Individual heat sources grow in capacity to meet demand or are reinforced with larger heat sources (e.g. EfW CHP)

DH Network Development

Stage 3 – Interlinking

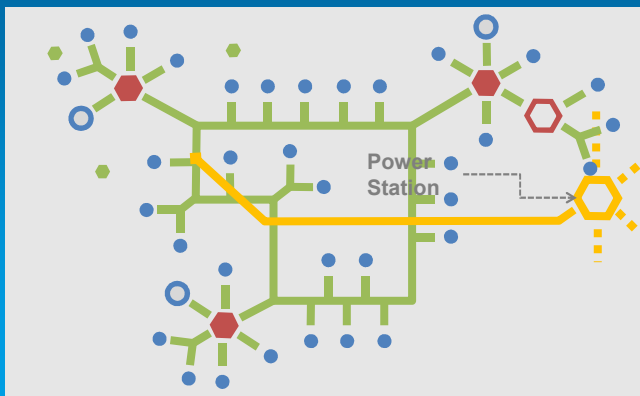


Interconnecting heat links installed to share excess heat capacity between clusters. Interconnector routes selected to enable further connection with economic demands situated between clusters

These can be developed by a 3rd party

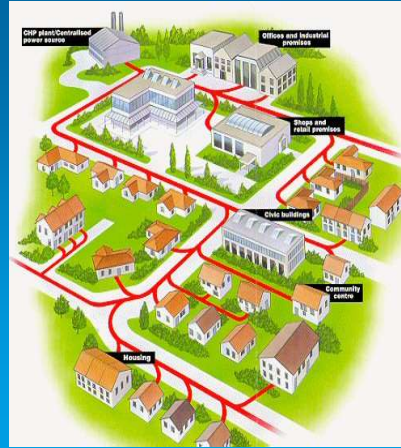
DH Network Development

Stage 4 – Regeneration



Original heat sources will have reached the end of their lives. These will be replaced with new heat sources, which may include surplus heat from power stations, carried via high capacity transmission mains.

Heat Loads – District Heating/Cooling Network



Some Specific Advantages of District Heating/Cooling (DHC)

- Can reduce the cost of Heating/cooling by up to 20% relative to individual solutions
- Can free up space in existing buildings by removing the need for individual system, providing flexibility
- Maintenance requirements are reduced, as there is no longer individual building plant to service
- Noise levels are lower, improving the environment for guests (in hotels)
- Refrigerant use for individual cooling system is eliminated
- Improved building aesthetics are achieved, due to removal of roof level cooling towers, freeing-up the roof for other purposes, like Solar heaters, etc

To summarise...Advantages of DHC

- DHC can utilise heat at low grade, from CHP, EfW plants, and process waste heat
- Can deliver low/No carbon heat/cooling
- Easy to change fuel or use of mix fuels
- Help utilise waste heat from industrial process, power generation, etc
- Improve utilisation factors
- Deliver higher efficiencies