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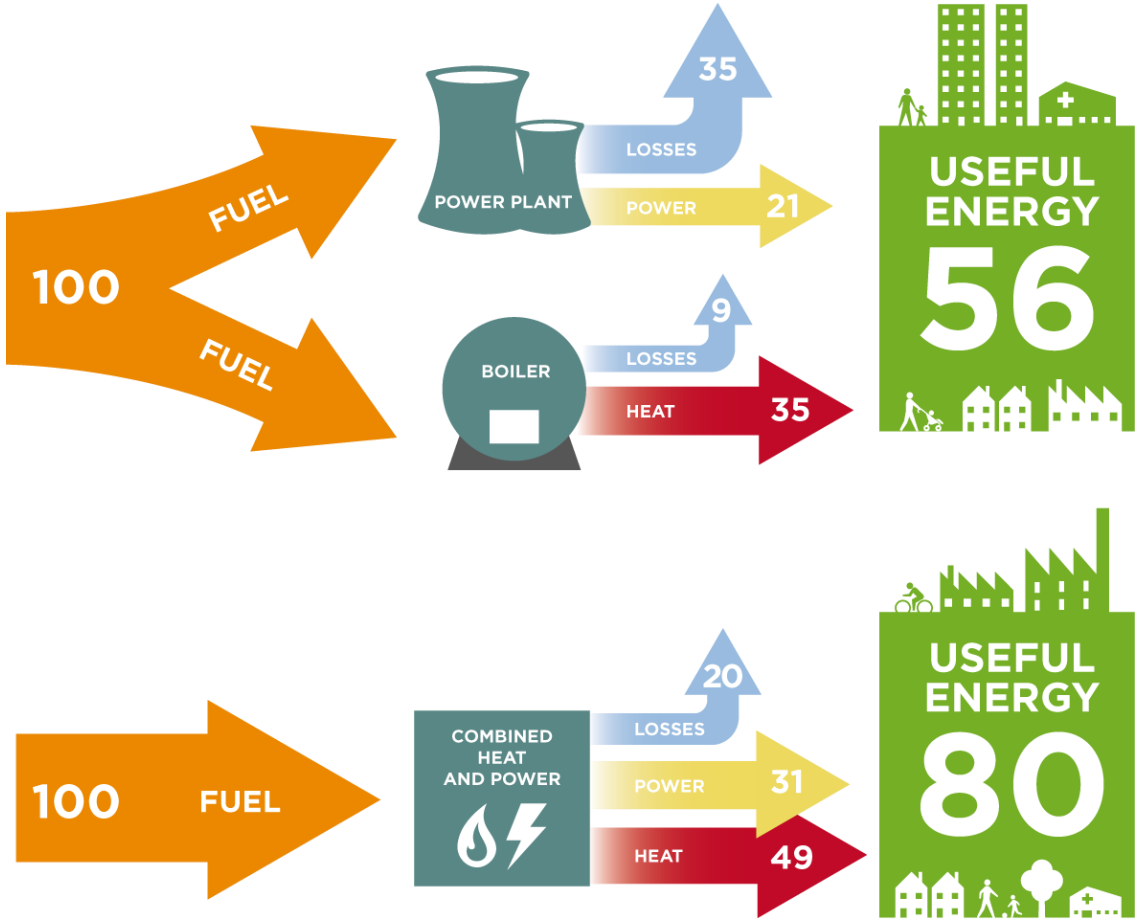
Newhurst ERF – Combined Heat and Power (CHP)

What is Combined Heat and Power (CHP)?

- CHP is a highly efficient process that captures and utilises the heat that is a by-product of the electricity generation process.
- This process makes use of the heat which would otherwise be wasted when generating electrical power.
- The heat could then be supplied in factories, residential homes and hospitals.
- CHP reduces carbon emissions by generating heat and power simultaneously, compared to the separate means of conventional generation via a boiler and power station.



Source: https://blogs.nottingham.ac.uk/sustainablenottingham/2016/09/29/12982/chp-diagram/

What is Combined Heat and Power (CHP)?

Heat is typically supplied from the energy recovery process in the form of steam and / or hot water, depending on the grade of heat required by the end consumers.

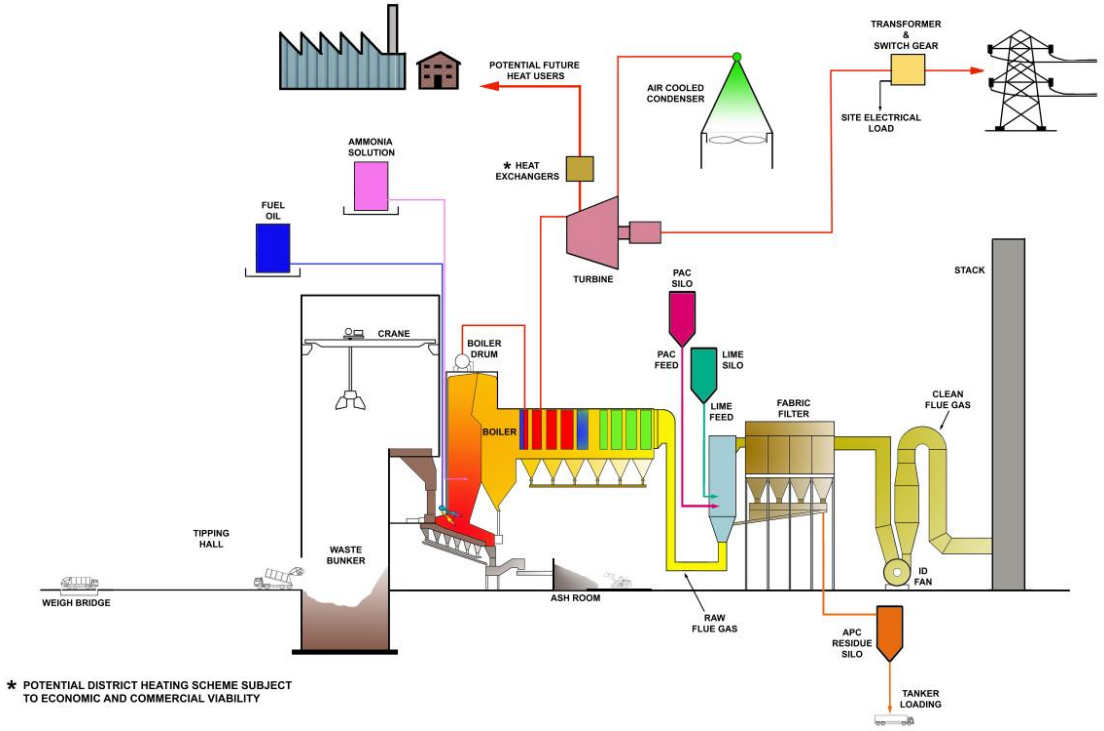
The most commonly considered options for recovering heat are:

1. **Heat recovery from the condenser –** wet steam emerges from the turbine exhaust typically at around 40°C. This energy can be recovered in the form of low-grade hot water from the condenser. Although this reduces the power output as it requires additional steam extraction to heat the condensate prior to being returned to the boiler.
2. **Heat extraction from the steam turbine -** Steam extracted from the steam turbine can be used to generate hot water for district heating schemes. District heating schemes typically operate with a flow temperature of 90 to 120 °C and return water temperature of 50 to 80 °C. Steam is preferably extracted from the turbine at low pressure to maximise the electrical power generated from the steam prior to extraction.
3. **Heat extraction from the flue gas -** Condensing the flue gas can be achieved in a flue gas condenser. However, the recovered temperature is typically no more than 80°C, which restricts the hot water temperature available for the consumer.

Newhurst ERF - CHP Study

- Following screening of potential heat consumers and development of a network heat demand profile, it has been established that technically feasible opportunities exist to export an annual average heat load of up to 17.77 MWth, and, when accounting for consumer diversity and heat losses, a peak load of 36.62 MWth.
- The Facility will be technically capable of meeting these heat loads, subject to economic feasibility. The maximum heat capacity of the Facility will be confirmed during commissioning and will be set as a minimum to meet the requirements of the heat consumers identified.
- The Facility will be Combined Heat and Power (CHP) when the identified heat loads are economically and technically feasible to connect. This means that the Facility will be able to export heat in the future with minimum modification. This will be achieved by virtue of having steam capacity designed into the turbine bleed and safeguarded space in the turbine hall to house CHP equipment.

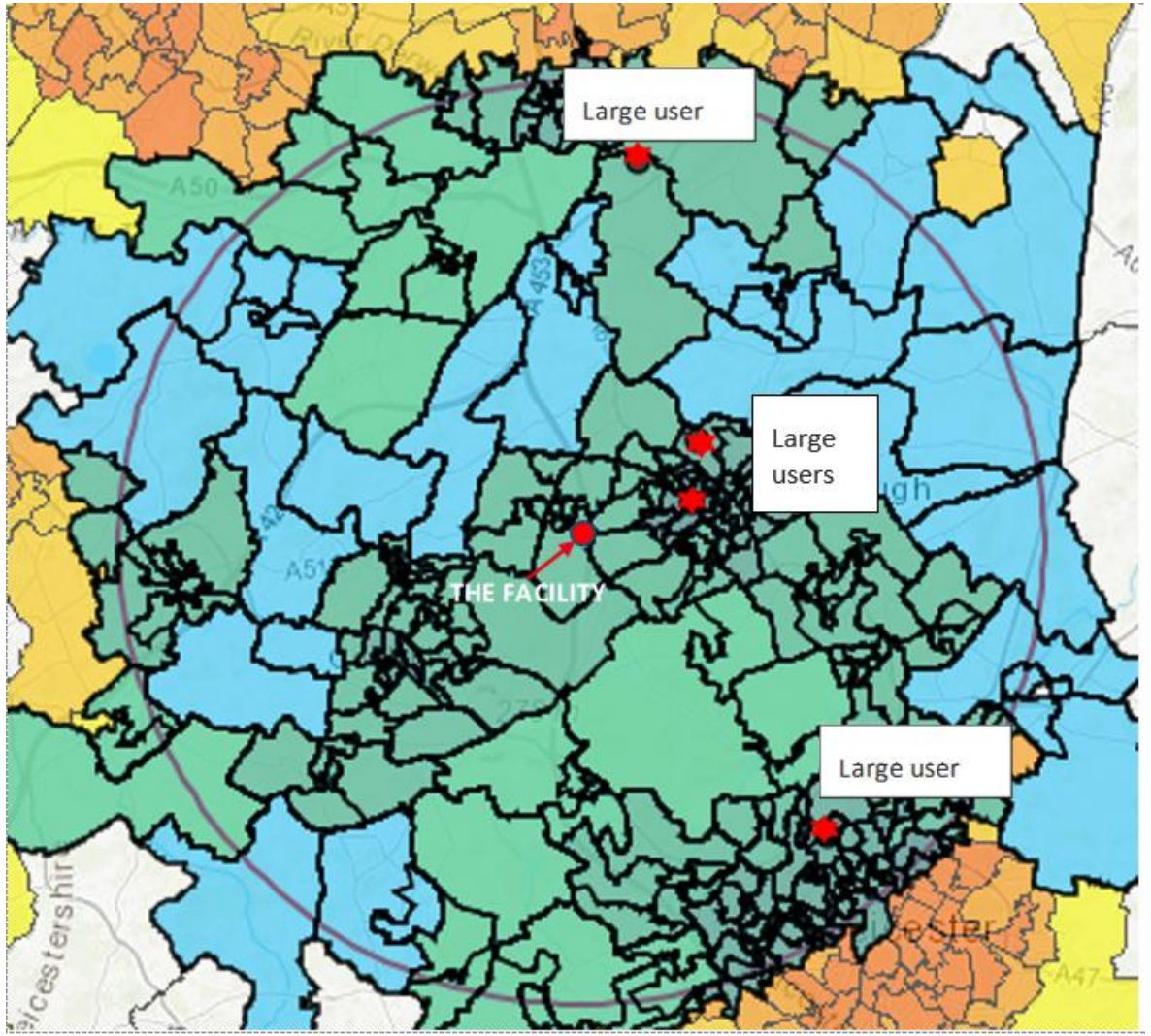
Details of Heat Supply



- The Turbine at Newhurst has a series of extractions at different pressures.
- High pressure steam could be extracted from the turbine and piped directly to the heat users – this would reduce net electricity output for Newhurst.
- Low pressure steam exiting the turbine could pass through an onsite heat exchanger to heat up the water for use in a heat network.
- Buried pre-insulated steel pipes could be used to distribute heat to the consumers for large distances without significant losses.
- The heat delivered to consumer premises is supplied to any boiler where the temperature is boosted to satisfy heating needs for the building.
- During plant non-operational periods, a back-up source of heat to meet consumers requirements would need to be proposed (for example, using oil/gas fired boilers or installing thermal stores to store excess generated heat)

Potential Heat Consumers

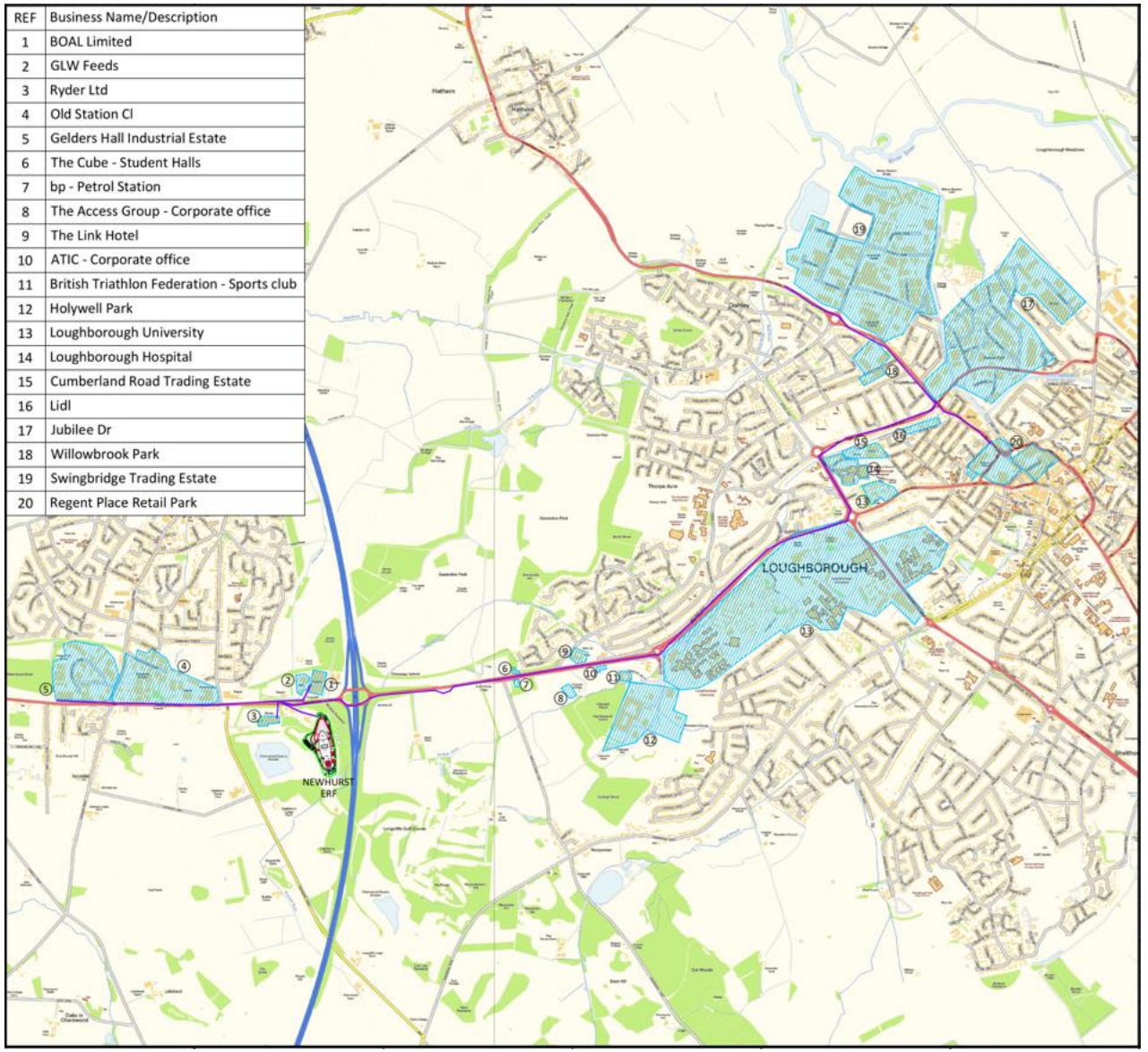
- The heat demand in the area surrounding the Facility is predominantly from the domestic and commercial/industrial sectors, and to a lesser extent, the education sector.
- In most cases, existing domestic buildings are unsuitable for inclusion in a heat network as a result of the prohibitive costs of replacing existing heating infrastructure and connecting multiple smaller heat consumers to a network.



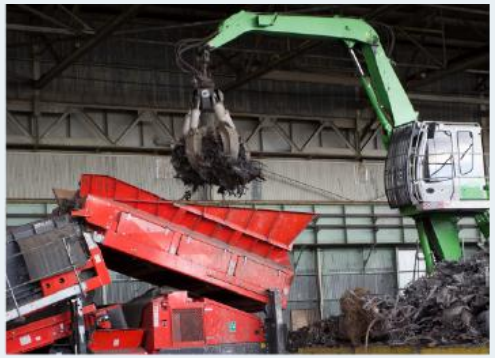
Source: UK CHP Development Map

Potential Heat Consumers

- The identification for potential heat demand was centered on nearby industrial and commercial users within a 9.2km radius.
- Physical constraints imposed by local infrastructure such as bridge crossing, railway line & rivers have a significant impact on which consumers can viably be connected. Some of these constraints require traffic management and permission from the highway authority which could be time consuming and costly.
- The 2 large heat users – Loughborough University and Swingbridge Trading estate – are being considered as potential heat users.



Thank You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