



CHP Outreach Workshops

Programme: Reducing Energy Costs with Combined Heat & Power

Birmingham 16th June 2015



Department
of Energy &
Climate Change

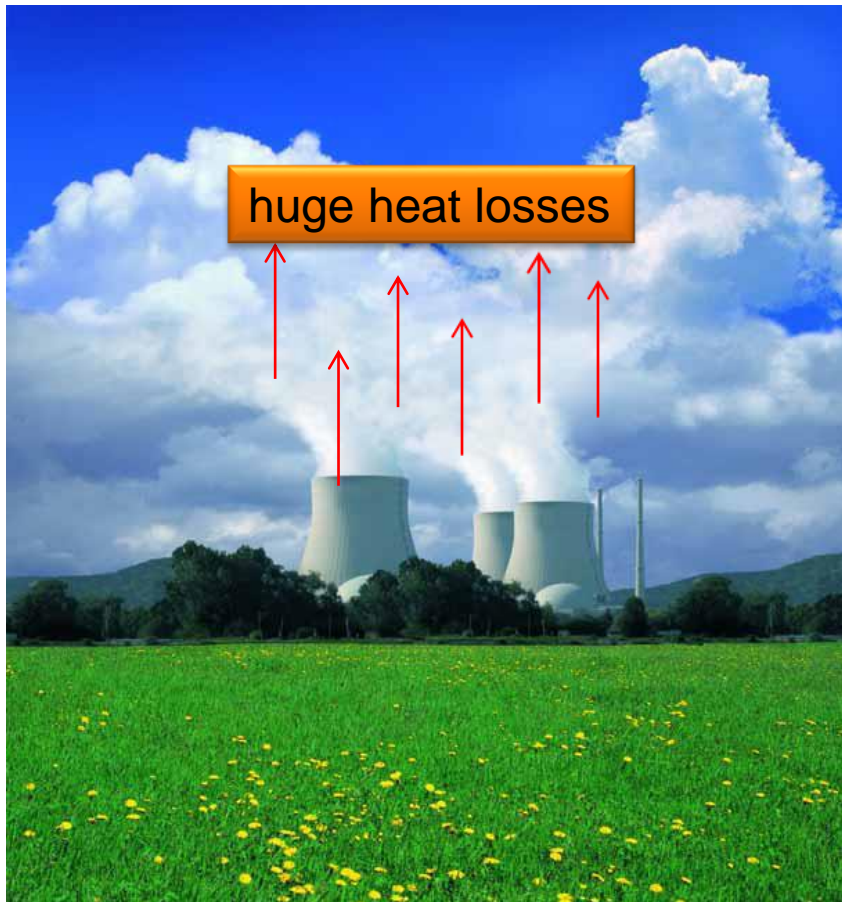


Introduction of CHP – The Flexible Option

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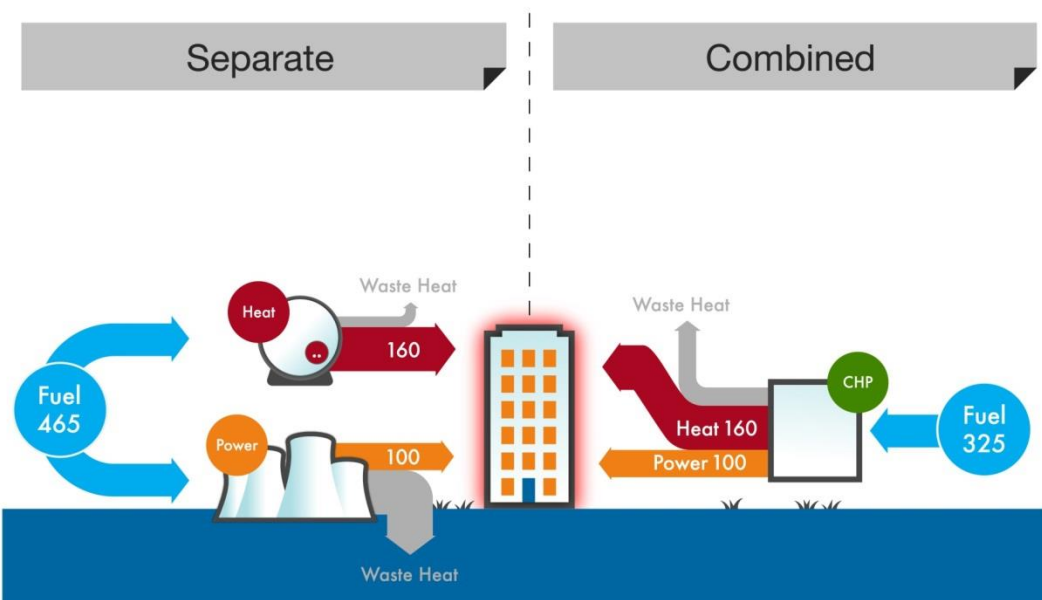
Power Station



- Average efficiency in the order 38%
- Waste enough energy to heat most of the buildings in the UK



What is CHP?



- Is the simultaneous production of electricity and heat (Useful Heat)
- Concerns the recovery of heat from power generation and its application for useful purposes
- Not a single technology but a design philosophy
- Delivers multiple benefits:
 - Primary energy savings
 - Emissions reductions
 - Cost savings



Why 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, which is rejected to atmosphere

Large CHP,
up to 75%
efficiency



Small CHP, up
to 85%
efficiency



Power Station, 35-
40% efficiency,
best available can
deliver about 48%

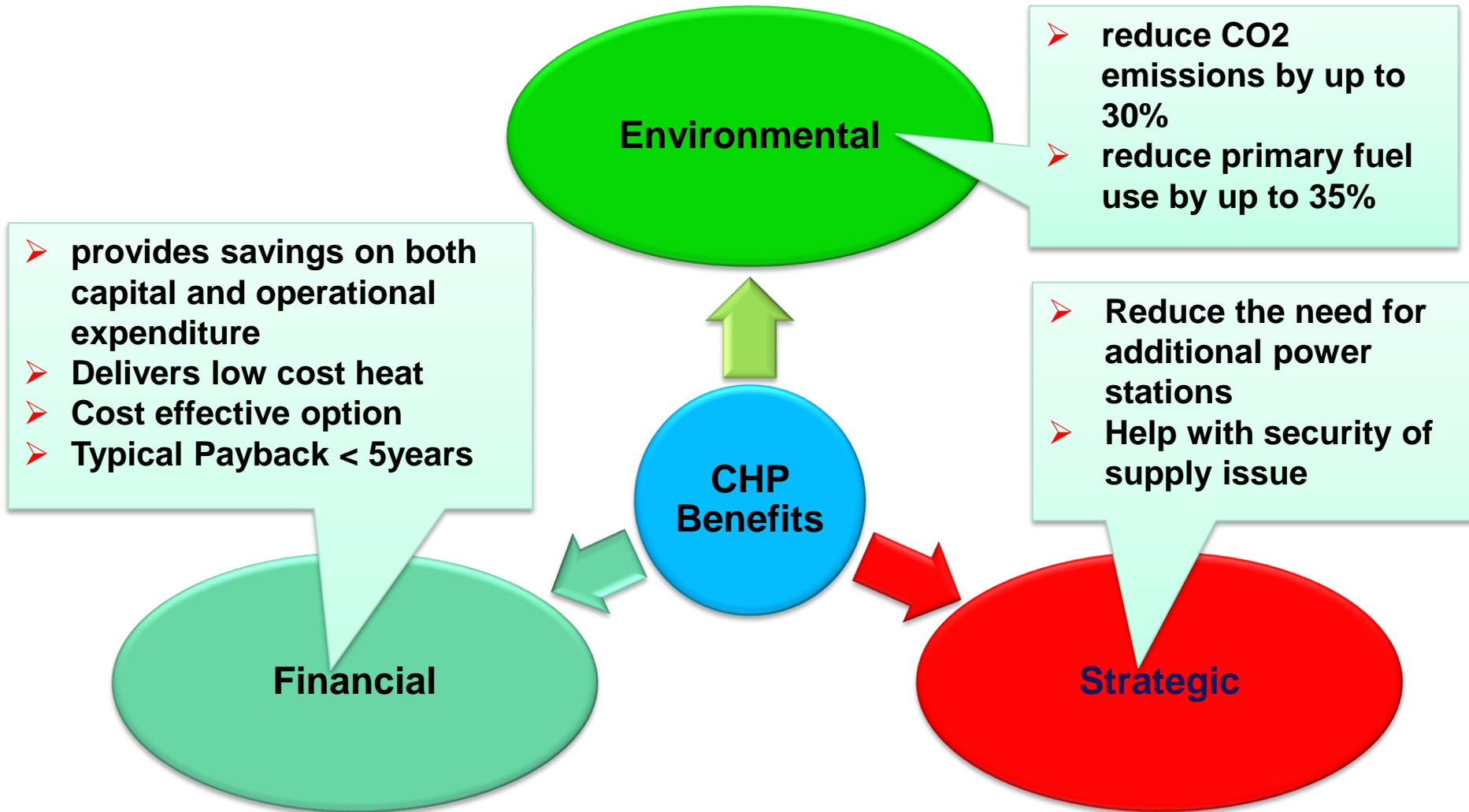


Micro CHP,
up to 90%
efficiency





Benefits of CHP?





Some History

- On-site CHP has been used over many decades in industries with large and simultaneous demands for heat and power... examples Paper, Chemicals, Refineries, Sugar
- Initially based on steam turbines using steam raised in high pressure boilers, used to be coal-fired, with turbine exhaust steam used for process heating.
- Over the last 40 years with the availability of natural gas, gas turbine and engine based electricity generating sets with heat recovery became the norm.



The Flexible Approach

Flexible Fuels

Conventional Fuels:

- Natural Gas
- Fuel Oil
- Coal

Alternative Fuels:

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





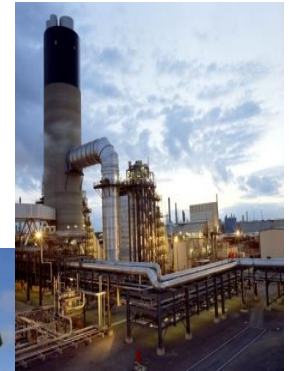
Flexible Technology

Established Technologies:

- Reciprocating Engines
- Gas turbine
- Steam Turbines
- Combined cycle gas turbine
- Organic Rankine Cycle (ORC)
- Fuel Cells

Emerging Technologies:

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





Heat & Power Options

Heating and cooling:

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

Power:

- Electrical
- Direct drive



Absorption Chiller installed at University of Edinburgh



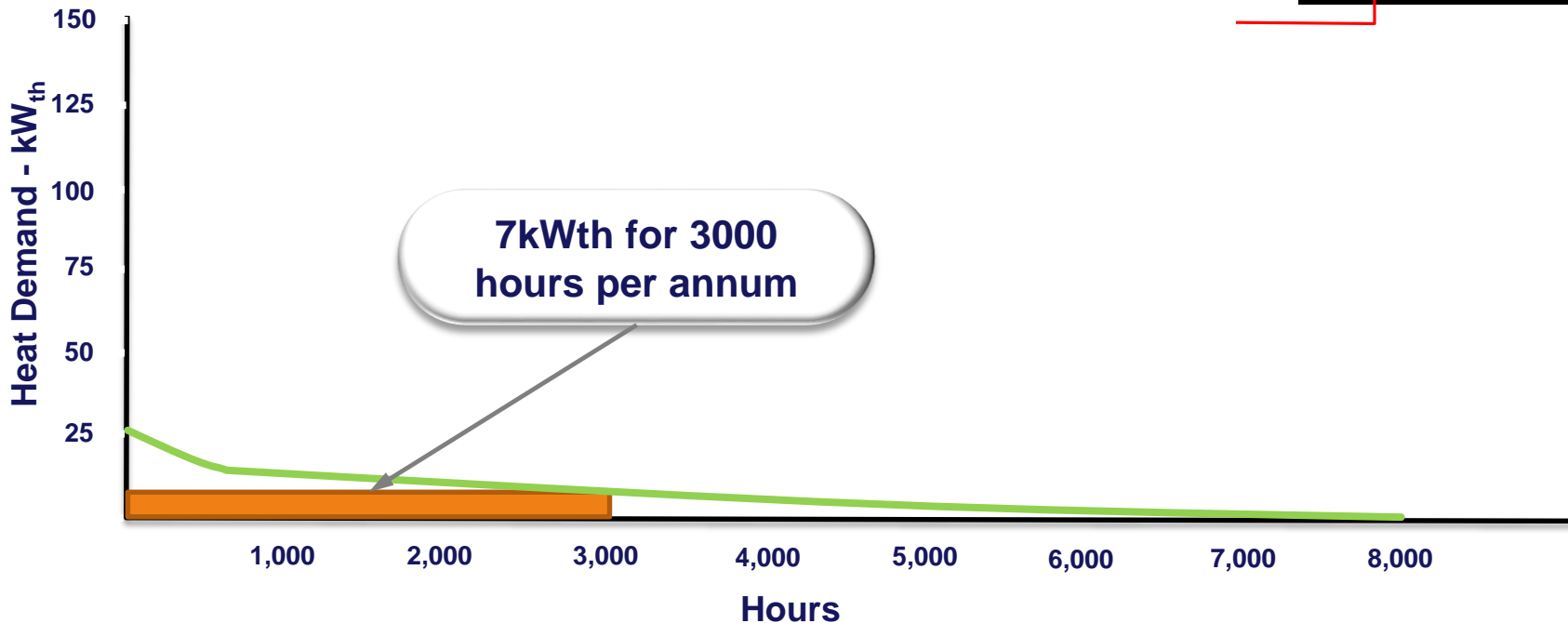
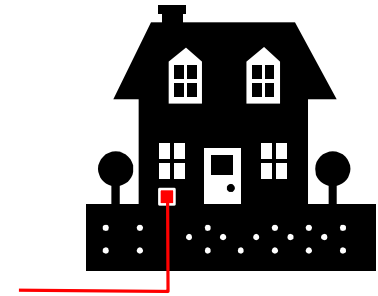
CHP Applications

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

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

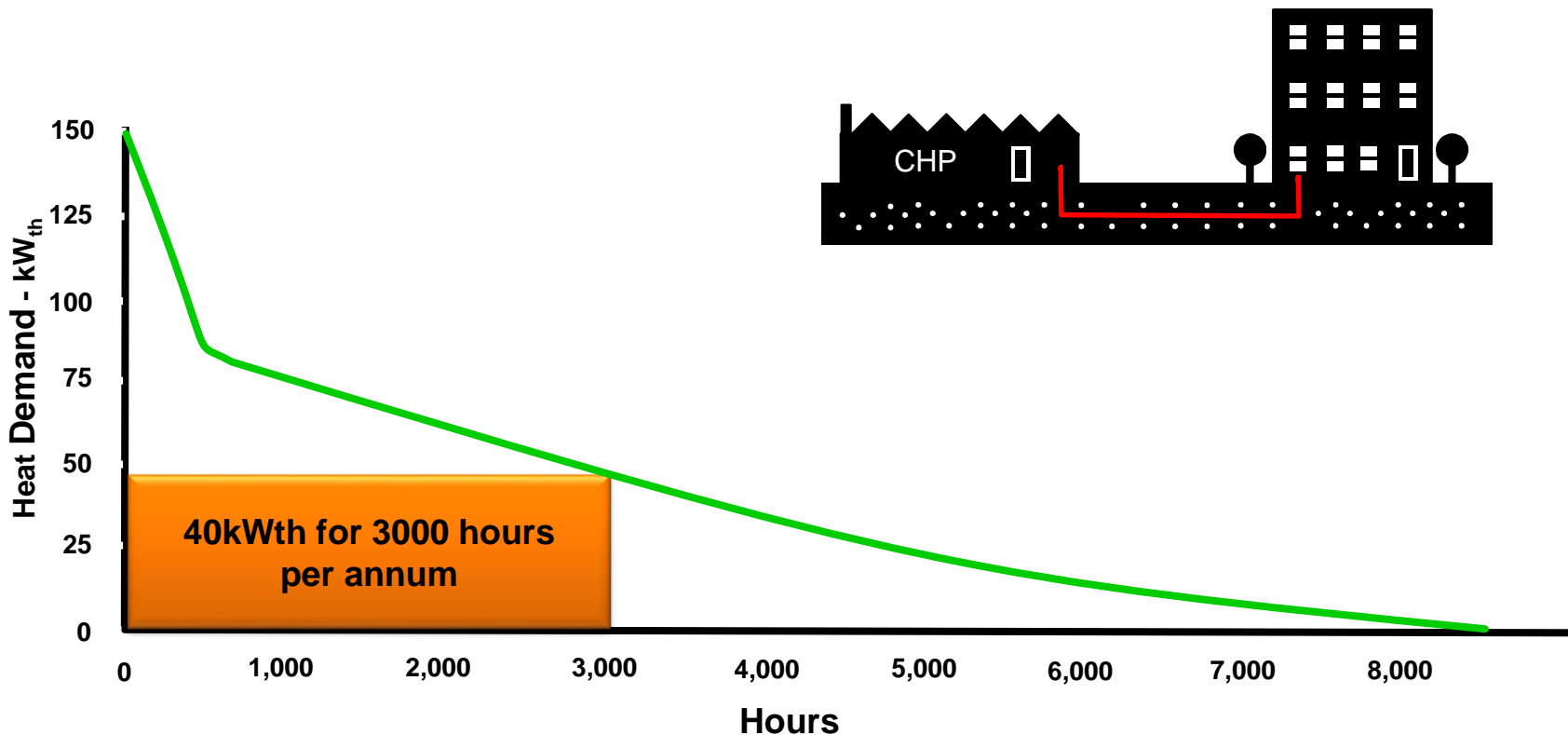


Heat Loads – Domestic CHP



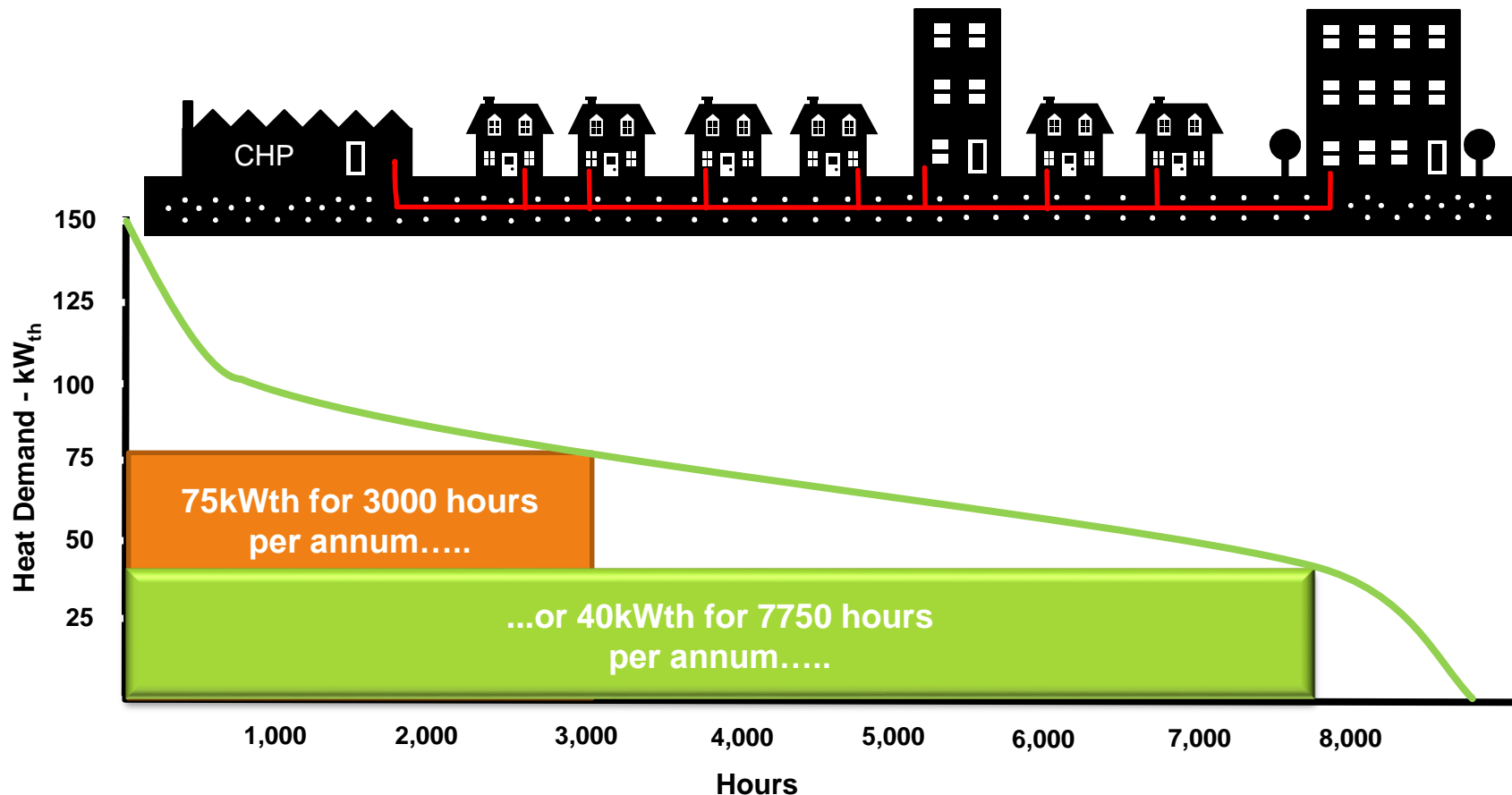


Heat Loads – Simple Community Heating





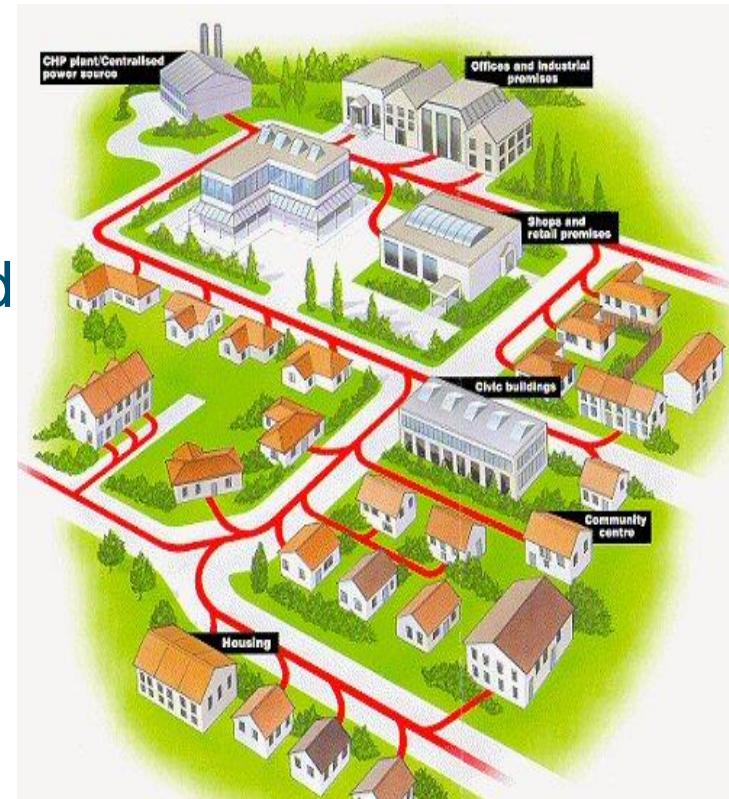
Heat Loads – District Heating Network Mixed loads





Heat Load – District Heating Network

DECC recognises that the development of heat networks will be a major factor in enabling low carbon heat (specially biomass and EfW CHP)





Heat Load – District Heating Network



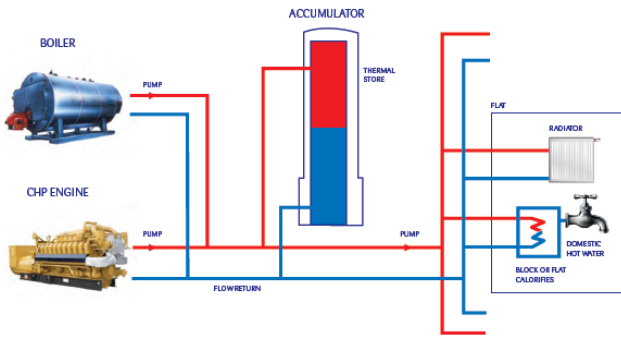
- To meet this role, DECC is now taking the following steps to support this:
 - Established a Heat Networks Delivery Unit (**HNDU**) to support authorities develop heating and cooling networks where innovative projects such as EfW CHP plants will be favoured

Full presentation will follow.....



What can be achieved: Pimlico Community Heating with CHP

The District Heating scheme today



- Established in 1950
- Serves over 3000 dwellings, 60 commercial properties and a school
- New CHP ~ 3.5MWe





What can be achieved: Sheffield EfW

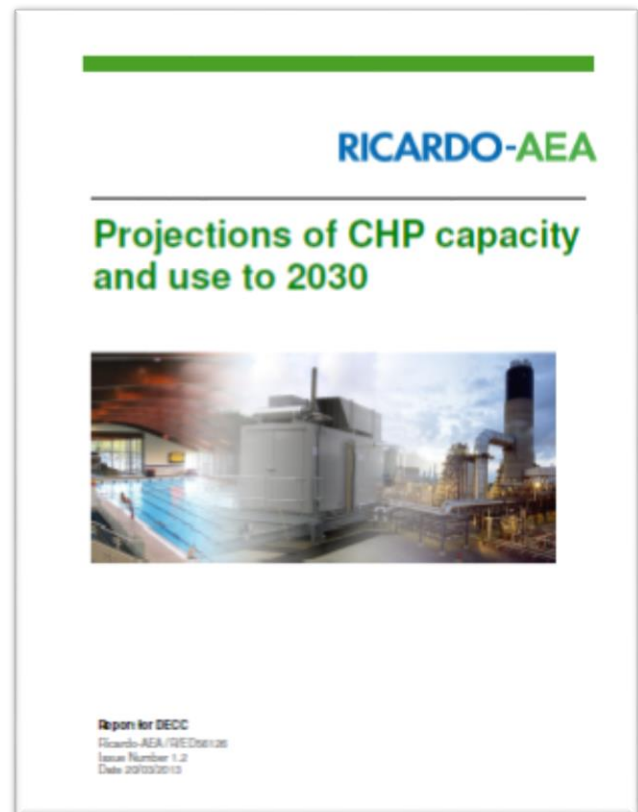
- Utilises 225,000 tonnes of waste
- To produce 60 MWth Heat
- 19 MWe Electric
- 2 linked Networks (12 km & 32 km)
- 2800 dwellings, and 140 buildings





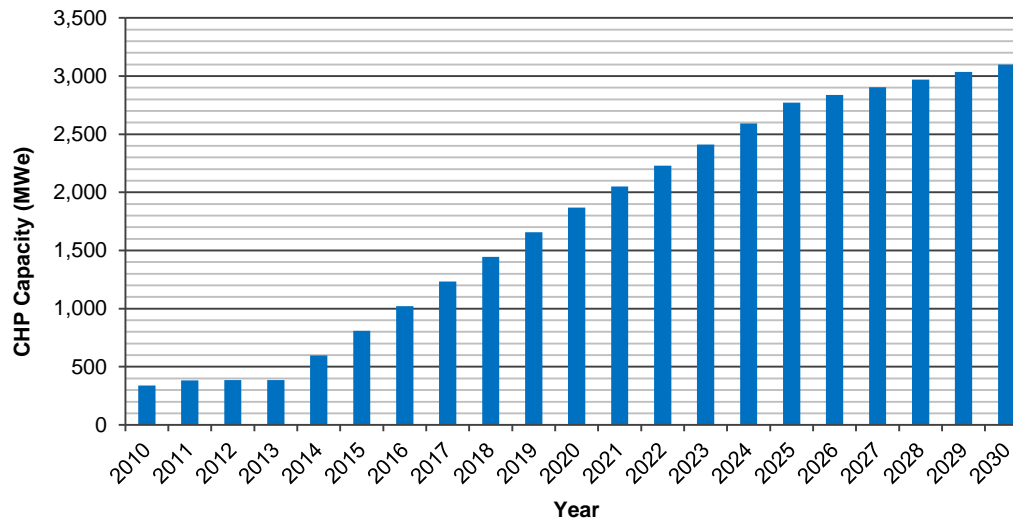
Projections of CHP Capacity

This study provides an overview of the development of both conventional (natural gas) and renewable fuel fired CHP markets in the UK to date, covering an evaluation of the technical, economic potentials between now and 2030 and how much of this is likely to be realised with current and planned policies.





Service sector capacity projection



Existing vs Potential in Health and Education sectors

Sector	Potential/Projection		Existing (2013)
	By 2020	By 2030	
Health	175	290	114
Education	620	1030	104



To Summarise....

Advantages of DH/CHP

- DH can utilise heat at low grade (from CHP, EfW plants) and process waste heat
- Can deliver low/no carbon heat
- Easy to change fuel or use a mix of fuels
- Helps utilise waste heat
- Improves utilisation factors
- Delivers higher efficiencies
- Helps alleviate fuel poverty