



CHP Outreach Workshops

Programme: Reducing Energy Costs with Combined Heat & Power

London 10th March 2015 Manchester 12th March 2015





Introduction of CHP – The Flexible Option

Mahmoud Abu-ebid CHPQA Programme Director





Power Station



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





What is CHP?



Primary Energy Saving [PES] = (465-325)/465 = **30%**

- 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







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 Engines
- 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







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
- Provision of grant funding to local authorities for the production of technical studies
- Main aim is to help LAs develop business plans that are sufficiently robust to attract a range of finance options.
- Full presentation will follow.....





1831

What can be achieved: Pimlico Community Heating with THE DISTRICT REASENCE OF THE DISTRICT O



- 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.

RICARDO-AEA

Projections of CHP capacity and use to 2030



Report for DECC Ricardo-AEA/RIEDsenzer Izoue Namber 1.2 Dete 20/03/2010





CHP Potential & Projection to 2020 & 2030

The technical potential of CHP was calculated at 29.4GW_e in 2012 rising to 31.8GW_e in 2020 and 33.8GW_e in 2030







Service sector capacity projection







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
- Will help in delivering ZERO Carbon buildings (CHP and renewable heat is Zero Carbon rated)
- Helps alleviate fuel poverty