DH for the UK – Summary **Gordon Taylor** **2021-04-05**

For decarbonising the heat sector, there are three possible energy carriers that can be used in networks:

1) Electricity - very high exergy, hard to store.
Proposal from the CCC - Hybrid heat pumps, combining electric heat pumps with gas boilers – bulky, complex and costly. Risky.

2) Gas - high exergy, hard to decarbonise.
Proposal from H21 et al - Hydrogen – combustion and safety, blue hydrogen requires CCS, green hydrogen requires very many electrolysers and renewables. Risky and costly.

3) Heat – best exergy match, well proven, compatible with UK heating systems, easy to store daily and seasonally, easy to decarbonise.
Possible proposal from Denmark – District Heating. Already deployed in UK. Widely deployed elsewhere. Very low risk. Easy to finance.

For 2030 – harness reject heat from gas-fired power plants, industrial processes and commercial cooling, waste incineration.
Carbon savings by displacing gas boilers.

For 2050 – harness heat from renewable sources – ambient water and air via large heat pumps, large scale solar, deep geothermal, daily and seasonal storage.
Carbon savings by displacing heat from gas-fired power stations.

Danish consultants advising cities (as in Scotland).

Carbon savings thereafter depend on the District Heating share of the heat sector – 17-24%, 42%, 70%.

Expand District Heating from many small existing schemes to city-wide – proceeding in parallel – many jobs.

Danish inward investment for District Heating equipment – e.g. piping (Logstor), pumps (Grundfos), Heat Interface Units and Controls (Danfoss) – more jobs.

UK equipment for installing District Heating – e.g. diggers (JCB) – more jobs.

The Danish proposal could comprise:
1) For the five to ten largest cities in the UK, identify nearby GTCC power plants for conversion to CHP.
Then estimate the carbon savings if the resulting co-generated heat was used for DH, displacing mostly gas heating.

2) Choose five to ten of the existing DH systems in the UK for proximity to rivers or the sea as sources of low-grade heat.
Then estimate the carbon savings if the existing fossil-fuelled plant was replaced by large heat pumps using the low-grade heat.

Advantages of DH

Intrinsically safe because the energy carrier is hot water. Conversely, electricity and gas can cause fires and explosions.

Gives the best temperature match of the heat carrier and the end use. Conversely, electricity and gas are ‘overkill’.

Able to harness reject and renewable heat to reduce carbon emissions to zero. This is not possible with electricity and gas networks.

Able to meet space and water heating loads without storage cylinders in buildings, due to hourly storage in the heat networks, and in attached daily and seasonal stores if required. This is not possible with electricity and gas networks.

No air pollution from combustion. Both natural gas and hydrogen produce NOx, which is a greenhouse gas and has adverse health effects.

Very reliable as it is owned, operated and maintained by professionals. This contrasts with electricity and gas, where the heating appliances are owned and operated by homeowners and building owners, who are also responsible for maintenance.

Well proven and long lived – 30 years or more – so is easy to finance at low interest rates.

Reduces the cost of fossil fuels – largely imported - for the heat sector, eventually to zero. The money saved can be invested in expanding heat networks and carbon savings, with most jobs in the UK. These can be increased if the components (e.g. piping, pumps, HIUs and controls) and equipment (e.g. diggers etc) are made in the UK.