The Production of Low Carbon Gas – why is it important?

Of all the sectors in the UK, decarbonising heat remains one of the most challenging. **Heat used for industrial, domestic and commercial purposes generates around a third of all UK carbon emissions, 70% of which is due to burning natural gas.** In order to meet our legally binding national climate change targets, unabated natural gas use for heat must be phased out. Low carbon gas - including hydrogen and biogases - is one option to replace it. The *Future Gas Series* examines the opportunities and challenges associated with using low carbon gas to help decarbonise the UK economy.

This is the second report in the three-part Future Gas Series. *Part 1: Next Steps for the Gas Grid* explored the potential to decarbonise the existing gas grid. This report focuses on the issues related to the production of low carbon gas. It considers the different production technologies, the potential scale of deployment of each method, and the potential feedstocks. It also discusses issues related to bulk transport and storage of gas. Put together from expert evidence from across industry and academia, it provides a balanced guide for policy makers in this area. It was a co-chaired by James Heappey MP (Conservative), Alan Whitehead MP (Labour) and Alistair Carmichael MP (SNP).

Carbon Connect suggests that biogases- such as biomethane and bioSNG- provide low regrets opportunities in the near term to provide low carbon heat and could also potentially make use of waste that would otherwise go to landfill. However, they require further support to allow them to continue contributing to decarbonising the UK economy. Hydrogen could provide huge decarbonisation opportunities and has applications across the energy system, from putting hydrogen in the gas grid to be burnt for heat in homes, to hydrogen buses and trains. However, to realise this potential, a market for hydrogen must be built up. This should incentivise business to invest in hydrogen technologies, reward those who use hydrogen, and build up hydrogen infrastructure.

What happens if we do nothing?

Natural gas use is second only to petrol in terms of fuel consumption in the UK. In 2016, natural gas supplied over 42% of the electricity and provided over 100TWh of energy to industry. It also provides heat to the 85% of domestic homes connected to the gas grid. Natural gas is also useful as an energy store to meet periods of peak demand in the coldest days in winter.

Just heat for domestic buildings accounts for 40% of our energy consumption and 20% of our greenhouse gas emissions, while heat for industrial processes makes up 85% of all industrial emissions. Taken together, heat for industrial, commercial and domestic purposes generates over a third of the UK's carbon emissions every year.

We are legally obliged to cut our carbon emissions by at least 80% relative to 1990 by 2050. To meet these targets, the government has set five-yearly carbon budgets which currently run until 2032. They restrict the amount of greenhouse gas the UK can legally emit in a five year period. The Committee on Climate Change (CCC) concluded in their 2018 progress report to parliament that '*The current reliance on natural gas is incompatible with long-term decarbonisation. Key strategic decisions will be needed in the early 2020s on low-carbon heat for properties on the gas grid. The main options for these properties are heat pumps and low-carbon hydrogen*.' In order to meet carbon budgets, the CCC has suggested that the UK must '*reduce emissions from heating and hot water by at least 20% by 2030, with a near complete decarbonisation by 2050.'* However, neither the building nor the industrial sector is currently on track to achieve the emissions cuts needed to meet either our fourth and fifth carbon budgets or our national decarbonisation targets. Instead emissions from industry and buildings both *grew* in 2017.

There are various possibilities to provide low carbon heat in buildings and industry, and also to replace natural gas in the UK energy system. Low carbon gas is one of these options.

What can be done?

Low carbon gases could provide low carbon energy across the heat, transport, power and industrial sectors, but they need to be developed further to better understand their potential. Carbon Connect suggest the following:

Support biogas production for decarbonisation in the near term

- Biogases- such as biomethane and bioSNG- are very similar chemically to natural gas, and can therefore be used straight away to replace natural gas in heating, industry and transport. However, biogases need continuing support from government, firstly to allow them to compete with natural gas in the energy market and secondly to encourage further development of the technology so it is as efficient and competitive as possible.
- Biogases can make use of sources of waste which might otherwise go to landfill where they can generate methane emissions. Food waste and sewage are two important sources of waste that can be used to produce low carbon gas- the Committee on Climate Change has recognised that properly disposing of food waste as one of the four most simple, low cost options to reduce emissions. However, to achieve this, waste strategy which is currently managed by the DEFRA must be aligned with energy strategy, which is managed by BEIS.

Develop a market for hydrogen for decarbonisation in the long term

- Hydrogen has potential applications across the energy system, including being injected into the gas grid and burnt for domestic heat, providing energy for industry and fuelling hydrogen buses, trains and other heavy goods vehicles. Developing production of hydrogen will entail building up the currently low levels of both supply of and demand for hydrogen. One of the challenges for policymakers is to incentivise businesses to invest in hydrogen, reward those who use it, and build up hydrogen production, storage and transport infrastructure.
- Hydrogen buses are already being used in Aberdeen and London. A wider roll-out of hydrogen buses in other local authorities is one way to build up early hydrogen demand in the near term. Other routes such as blending hydrogen with natural gas in the gas grid to supply heat to domestic homes could operate on a larger scale and therefore support early carbon capture and storage projects. These latter projects are likely to require a significant role for government to support the investment.

Learn lessons from the power sector- deployment can lead to cost reductions and technology improvements

- The power sector has undergone rapid decarbonisation in recent years. While there are different challenges in decarbonising the heat sector, there are still lessons which can be applied. One is particularly important: it was only through deployment of renewable generation technologies- at sufficient scale to allow competitive supply chain development, standardisation and further innovation- that costs came down and their potential was fully realised. If the UK is to exploit the potential offered by low carbon gases in time to contribute to the 2050 decarbonisation targets it will need to run install production technologies in the near term.

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