Briefing – Decarbonisation of Heat and the Leeds City Gate Project

Conversion of Gas Grid to 100% Hydrogen Gas

Decarbonising heating is substantially more difficult than decarbonising the electricity grid but it is a necessary part of meeting our climate targets. Energy demand for heat is high and varies considerably over the year with severe daily fluctuations and seasonal peaks. Gas is the perfect peaking fuel, to meet such swings in demand and over 80% of our heat demand is met by natural gas. However, the current natural gas network which supplies gas to heat our homes and offices is primarily methane gas which produces CO_2 emissions when combusted.

One way currently being considered to achieve significant decarbonisation of heat is to change the gas we use in our homes from methane gas to 100% hydrogen gas. In this scenario the current gas pipelines which make up the gas network would be used to transport hydrogen rather than methane.

Unlike methane; Hydrogen gas has zero emissions at point of use.

In addition, most technologies that use natural gas such as domestic central heating systems can be adapted to use hydrogen making the conversion of existing gas networks to hydrogen and 'greening the gas grid' a serious consideration. The technology to produce hydrogen is well understood and already routinely applied in industry and when coupled with CCS large scale hydrogen production can be achieved with ultra-low carbon emissions.

Hydrogen has great potential as a climate change technology. Hydrogen is extremely versatile and can be used to produce heat or power for domestic heat, for direct industrial applications, in fuel cells, converted to liquid fuel for transport or for use in CHP fuel cells for low carbon heat provision.

The H21 Leeds City Gate Project

The H21 Leeds City Gate Project is a study funded by the UK Government which focused on assessing the feasibility from both a technical and economic viewpoint of converting the existing methane gas network in Leeds to a 100% hydrogen gas network.

The study was completed in July 2016 and concluded that the Leeds gas network has the correct capacity for such a conversion and confirmed that no significant technical barriers exist regarding a conversion to hydrogen. The study found that the earliest date for beginning the conversion of a UK city using the Leeds model is 2025.

The project also produced a programme of works and a roadmap of tasks required to convert the Leeds gas network to hydrogen and also produced a plan for the incremental rollout of such a system across UK cities and regions. The UK Government are considering their next options regarding this proposal which would begin with the establishment of a Programme Team to take the initiative forward.

Scottish Gas Networks (SGN) – have recently commenced a procurement exercise to commission their own feasibility on a 100% hydrogen conversion to the Scottish gas network.

UK Government – the UK Department for Business, Energy and Industrial Strategy (BEIS) and their predecessor DECC seem to be mindful of the opportunity hydrogen may represent within its decarbonisation plans and as well as the Leeds Project has also commissioned a suite of complimentary studies to appraise the potential for hydrogen including:

- **HyHouse -** Evaluated the risks associated with using hydrogen in a domestic setting. This project took place in a two-storey, three-bedroom farmhouse in Scotland provided by SSE. The outcome of the HyHouse project was reassuring and concluded that the risk associated with using hydrogen in the home was no greater than the risk associated with using natural gas.
- **Desk Study on Hydrogen Appliances:** investigated the feasibility of developing a supply chain for domestic and commercial appliances that could use 100% hydrogen instead of natural gas.
- **Green Hydrogen Standard –** a consultation and study to define in precise and technical terms what Green Hydrogen is and finding a way of providing assurances to buyers of hydrogen that the product they are purchasing meets their environmental expectations.
- **UK Roadmap for Hydrogen and Fuel Cells –** The Scottish Government helped fund an independent study to provide an overarching strategy for hydrogen and fuel cells to play a greater role in the UK's energy mix. The Roadmap, which will be published in full in the near future, also describes strategies for success in 11 key market segments in which the UK has the potential to show leadership.