

H21 Hydrogen for Leeds Project Case Study



Kiwa Gastec was a Technical Lead in this Northern Gas Networks project, sponsored by GNIC.

Leeds' existing gas infrastructure could be repurposed to deliver hydrogen for heating and cooking, instead of natural gas to the (population 760,000) over the next fifteen years.

The technical expertise provided in this project is sought by utilities and innovators, often in government-backed initiatives.

Why?

Over recent years, the UK has made significant progress in decarbonising its economy, but while its cities depend on natural gas for heating and cooking, there is a limit to how much carbon emissions can be reduced. Widespread conversion from natural gas to hydrogen would make a huge contribution to achieving Britain's emissions target of an 80 per cent cut in emissions (on 1990 levels) by 2050.

What is the H21 project?

The project redesigned the gas network to establish a high pressure (17 bar) outer city ring main transporting methane (CH₄) to steam methane reforming (SMR) plants for distribution into the network (below 7 bar).

Conversion would be a major infrastructural transformation, and many hydrogen compatible appliances and burners would need to be installed or converted, and a workforce trained to undertake the process. Hydrogen and electricity would become the dominant heating fuels.

Hydrogen would be produced from low carbon technologies such as:

- Steam Methane Reforming (SMR) of natural gas plus Carbon Capture and Storage (CCS)
- Electrolysis using renewable electricity
- Novel nuclear techniques

The captured carbon dioxide would be stored in depleted oil and gas wells in the North Sea.

Consultancy

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Project outcome

Relative to full low carbon electrification or district heat for Leeds, conversion to hydrogen offers:

- A simple route to full local decarbonisation
- Avoids the challenge of persuading 23 million homeowners and businesses to adopt a complex mix of decarbonisation techniques of greatly variable efficacy

The role of Kiwa Gastec

We developed the front end engineering design for the project, which included:

- Calculation of annual gas use (domestic and non-domestic)
- Establishing annual design load to accommodate lowest temperatures over a 20 year range
- Calculating SMR capacity required
- Determining size of low pressure store /intraday line pack
- Determining design methodology for medium and low pressure network with reference to standard gas industry procedures
- Completing study of number of isolations vs size of change over area
- Identifying several potential sites for SMRs, high and low pressure storage
 - domestic and non-domestic conversion
 - SMR
 - CCS
 - Pipeline (natural gas, hydrogen, carbon dioxide)

Here is the [NGN H21 project report](#).