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Greening the grid – hydrogen as the key to decarbonising the UK's gas network

Average household emissions three tonnes

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Image: Richard Hulf and JJ Traynor

Blending 20% of the game-changing fuel into the gas grid could trigger significant carbon reductions, positioning the UK as a leader in the global energy transition.

Britain's world-leading gas network spans 284,000 km, with 85% of UK homes connected to the gas grid. Historically, the grid was fuelled by 'town gas' – a heavy-polluting gas created from coal and consisting mainly of hydrogen, methane, and carbon monoxide – until it was displaced by cleaner and more affordable North Sea natural gas in the 1970s, marking somewhat of an energy transition.

Today, natural gas accounts for nearly half of all energy use in the UK.[1] The average household's carbon emissions stand at nearly three tonnes, and households remain the highest contributors to overall UK GHG emissions.[2] If the UK is to reach its net zero ambition, household emissions must fall dramatically to 135 kg by 2050 – a 95% reduction from today.[3]

How will this be achieved?

Though heating is a notoriously hard-to-abate sector, blending – the process of mixing natural gas with up to 20% clean hydrogen – offers one viable solution. A 20% hydrogen blend could save up to 6

[1] Oil & Gas UK: UK must allow new oil and gas fields – or risk surging import bills and future shortages, say industry experts (22 November 2021).
[2] Office for National Statistics: UK Environmental Accounts: 2021 (3 June 2021); Energy Networks Association: Britain's Hydrogen Blending Delivery Plan (13 January 2022).
[3] Energy Networks Association: Britain's gas grid to be ready to delivery hydrogen across the country from 2023, energy networks announce (13 January 2022).

million tonnes of CO_2e every year – the equivalent of taking 2.5 million cars off the road – or a total of around 41 million tonnes of CO_2e between 2023 and 2032.

The UK Government has championed the development of hydrogen blending, making it a key pillar of its decarbonisation ambitions. Hailed as a way to kickstart the UK clean hydrogen economy and accelerate the transition to a zero-carbon gas grid, blending features prominently within the Government's Ten Point Plan, Energy White Paper and Hydrogen Strategy, with all three publications pointing to hydrogen to deliver lower carbon heating and cooking, without disruption for everyday consumers.

Real-world blending

Hydrogen presents itself as somewhat of a super-saviour in the energy transition, but how does blending work in practice? Globally, the race is on to answer that exact question, with Germany, Italy, New Zealand, and others all working to inject a higher percentage of hydrogen into gas networks, while ensuring the integrity of existing infrastructure and appliances is not compromised.

The UK has proven that a 20% blend in its own gas network is indeed feasible following the success of Northern Gas Network's 'HyDeploy' pilot project late last year, delivered in partnership with Keele University. The HyDeploy project delivered more than 42,000 m^3 of hydrogen to 100 homes and 30 university buildings at Keele University in Staffordshire saving more than 27 tonnes of carbon emissions.

While the carbon savings alone were a huge win for HyDeploy, the project also demonstrated a key lesson – hydrogen can be delivered effectively and safely at the 20% blend level. With minimal modifications to the current gas grid infrastructure, no changes to customers' appliances and no pipeline disintegration, HyDeploy confirmed hydrogen's potential to transform the UK's gas network.

Mobilising investment

Building a mature low-carbon gas economy – supported by hydrogen – will require significant investment.

Blending is a clear catalyst for hydrogen demand, with 44 GW of clean hydrogen needed per year if a 20% blending regime were to be implemented.[4] Such a plan would ensure strong demand for clean hydrogen, helping to unlock the necessary investment into clean hydrogen production capacity.[5] The UK Government is set to announce the details of its £240 million Net Zero Hydrogen Fund in early 2022. However, many multiples of this fund will be required to deliver clean hydrogen at a scale that can move the needle on decarbonisation, and there is a significant opportunity for the investment community here.

Through hydrogen investment, investors can provide hydrogen producers the platform they need to meet Britain's clean hydrogen targets, ultimately supporting hydrogen blending delivery and a lower-emissions economy.

[4] Based on HydrogenOne Capital calculations.
[5] UK Government: UK Hydrogen Strategy (17 August 2021).