

HYDROGEN: FUEL FOR THE FUTURE

There's a new industry being created right before our eyes, an industry that could revolutionise every facet of the global economy and help the UK reach net zero greenhouse gas emissions – hydrogen.

Hydrogen has the potential to be used across our economy, particularly where electrification is not an option. The Government is aiming for 10GW of low carbon hydrogen production by 2030 and projects that hydrogen will represent 20 to 35% of the UK's total energy consumption in 2050. With predictions that the global low carbon hydrogen economy will be worth nearly \$1 trillion by 2050, Clare King, Liam O'Flynn and Reece Ballett from Freeths' Clean Energy, Waste and Sustainability team explained the opportunities and challenges.

Opportunities

An alternative to natural gas – lots of equipment and existing infrastructure like combustion engines, boilers and turbines can use hydrogen if blended with methane.

Hydrogen fuel cells – these produce an electrical current, water and heat, can give a continuous output of heat and electricity, are more reliable than lithium-ion batteries and more efficient than combustion engines.

For heating – trials of pure hydrogen (Hy4Heat) and blended hydrogen (HyDeploy) in heating are underway and a decision on viability is likely to be made by late 2026. Pure hydrogen is unlikely to be rolled out for domestic heating on a national scale as existing boilers in domestic properties and the gas grid would not cope.

For industry – hydrogen can produce higher temperatures than electrification for processes such as industrial furnaces. With a constant input of hydrogen and oxygen, a hydrogen fuel cell gives constant output, essential for industries like manufacturing. Hydrogen could replace gas fired CHP engines as backup power.

In transport – the transport sector is the largest single contributor to UK domestic greenhouse gas emissions. There are hydrogen buses on the road already in the UK and Siemens has developed a hydrogen train. Replacing diesel trains with electric ones is hampered by the cost of electrical rail infrastructure but hydrogen-powered trains use the existing infrastructure. In 2025 the Government is expected to decide whether to mandate all HGVs run on hydrogen. It can also be used in shipping, aviation, and even space exploration.

Energy storage – the UK does not have enough storage capacity for electricity meaning, wind turbines are turned off when the electricity generated isn't being used. That energy could be used to electrolyse water producing hydrogen that you can store, use in industrial processes, manufacture transport fuels with, or re-electrify later.

Price guarantee – the Government has adopted a contract for differences (CFD) model, giving hydrogen producers the certainty of a set price for their product.

Challenges

Producing low carbon hydrogen – the three methods for producing low carbon hydrogen all have limitations. Steam reformation (combining purified natural gas and steam in the presence of a catalyst) requires the capture and storage of the CO₂ generated, but carbon capture and storage is expensive and has critics. Methane pyrolysis (heating methane with a catalyst to produce hydrogen gas) produces solid carbon which can be used as an additive for steel or filler in car tyres but production has not yet been proven to scale. Electrolysis (using renewable low carbon electricity to split water into its components of hydrogen and oxygen) is very energy intensive and many electrolyzers on the market require a stable delivery of electricity which is incompatible with solar and wind power.

Cost – low carbon hydrogen is expensive compared to natural gas but this should improve as the market matures.

Regulation – the Gas Act allows for hydrogen to be used in the gas grid but more regulation will be needed.

Standards – the Low Carbon Hydrogen Standard sets a maximum threshold for the amount of greenhouse gas emissions allowed in the production of low carbon hydrogen. The standard will be supported by a

certificate scheme due in 2025, with the potential for creating a secondary market for low carbon hydrogen and hydrogen certificates.

For advice on low carbon hydrogen, contact the Clean Energy, Waste and Sustainability team at Freeths: Clare King, 03451286950 clare.king@freeths.co.uk, Liam O'Flynn, 03451286986, liam.o'flynn@freeths.co.uk and Reece Ballett, 03451286980, reece.ballett@freeths.co.uk