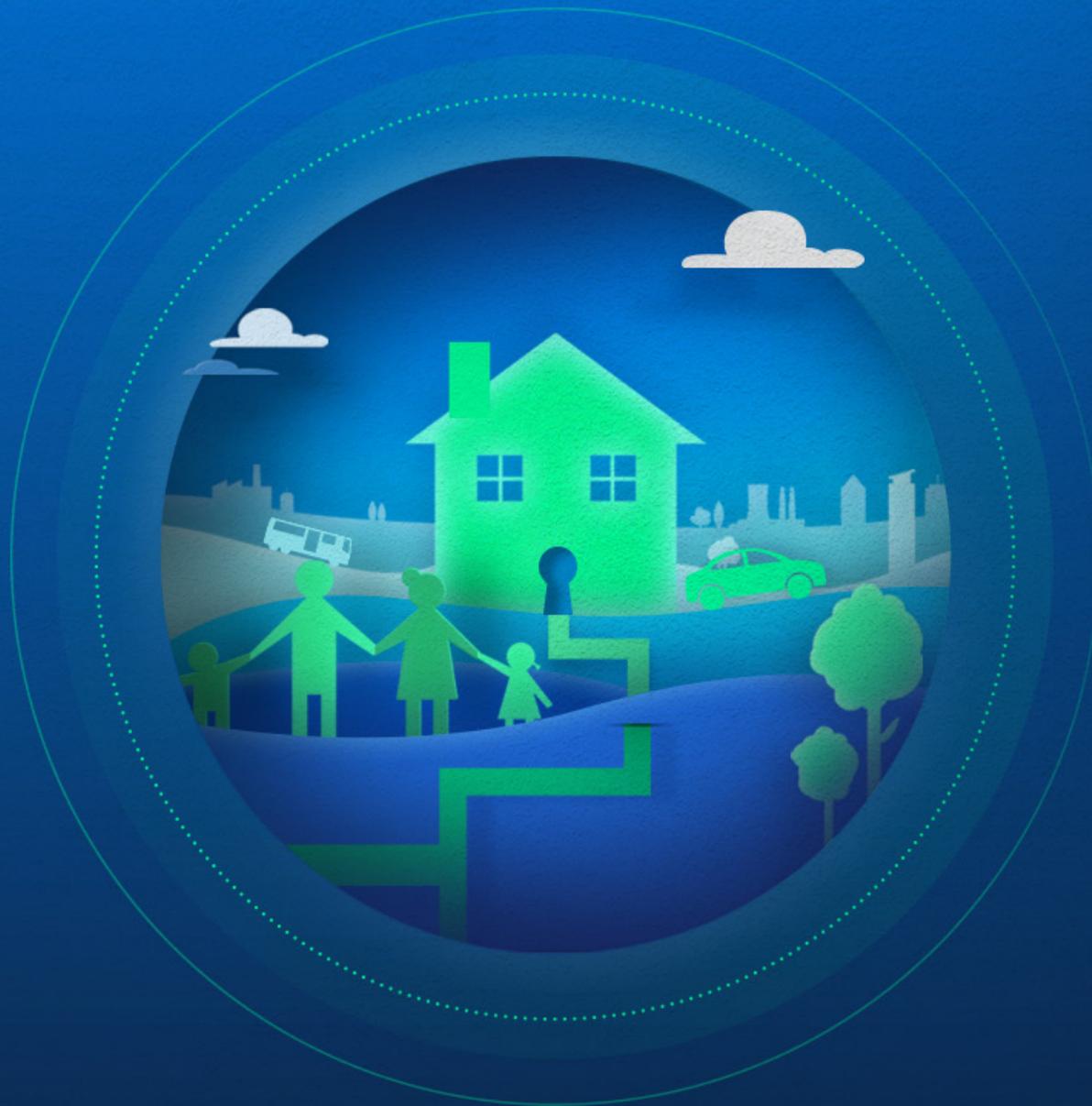


**GAS GOES
GREEN**

OUR EXPERTISE, YOUR SECURITY.

OUR COMMITMENT TO BUILDING
A SAFE AND SECURE ZERO
CARBON GAS GRID





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BRITAIN'S GAS NETWORKS: OUR TRACK RECORD

85% 

of Britain's homes currently rely on natural gas for their energy.

Britain's gas network has **284,000 KM** of gas pipelines.

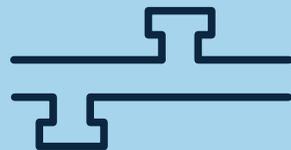


Britain's gas networks have a reliability rate of

99.9%

On average, there is an unplanned interruption to supply once every

140 YEARS



60,000KM

The amount of **hydrogen-ready gas pipelines** now installed in local gas grids – **enough to go around the world's equator one and a half times.**

Britain's gas networks manage the transportation of a natural gas under pressure to more than

24.5 MILLION

household and business connections.



55%

The increase in GB energy demand during the unexpected 'Beast From The East' cold snap of March 2018, met by gas networks, when the temperature dropped as low as **-14 Celsius.**

Since 2008, gas network companies have **invested £265 million in 536 innovation projects.**



Almost **75%**

of safety incidents that occurred in 2018/19 involved carbon monoxide from faulty or poorly maintained gas boilers, **a risk that would not be present with hydrogen.**

5x

more energy is delivered to Britain's homes and businesses by gas than electricity at times of peak demand.

Household carbon emissions from **heating, cooking & hot water** need to drop by

95%

in the next 30 years, to reach the UK's Net Zero target.



OUR COMMITMENT TO BUILDING A SAFE AND SECURE ZERO CARBON GAS GRID

Britain's gas grid is one of the safest and most reliable in the world.

For 24 hours a day, 7 days a week, 365 days a year, it safely and securely delivers the energy that 24.5 million homes and businesses across the country use for their heating, hot water and cooking.

But we must replace the natural gas that so many of us rely upon, to play our part in tackling the climate emergency.

Through the Gas Goes Green programme, Britain's five gas networks are collectively committed to the replacement of natural gas with hydrogen and biomethane, to create the world's first zero-carbon gas grid.

Using hydrogen in our homes creates the opportunity to reduce our carbon emissions in a way that means we can use our heating, hot water & cooking exactly as we are used to. It will ensure that energy companies share the hard work of reducing Britain's household carbon emissions.

The results of our work to date have shown that delivering hydrogen through Britain's gas grid is fundamentally safe. As this work progresses, we will:

1

Maintain a safety-first approach

Our gas networks will adhere to the same high standards of safety as today, wherever they are, and whatever gas they are carrying.

2

Create new opportunities

We will use new technology to make Britain's gas networks even safer than they are today, as we transition towards hydrogen.

3

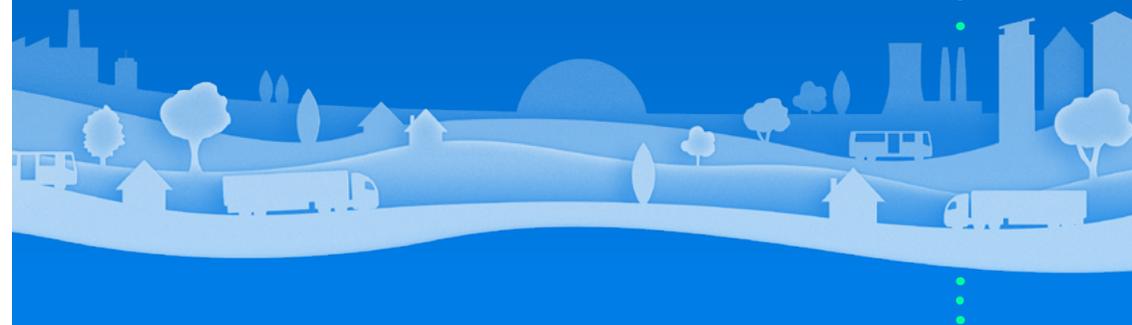
Act transparently

We will share the outcomes of safety-related gas network innovation projects in a transparent way, and support the wider development of best practice for the safe use of hydrogen.

4

Support consumer choice

We will safety test the widest possible range of hydrogen-ready technologies, so people can choose the appliances best suited to their needs.



OUR COMMITMENT TO BUILDING A SAFE AND SECURE ZERO CARBON GAS GRID

It is these principles that our five companies are committed to through the world leading innovation projects we are delivering in this area, as well as the work we are continuing to deliver through the Iron Mains Risk Reduction Programme. It will underpin our work as we start blending hydrogen into the gas grid and help design Britain's first 'hydrogen towns'. They will act as the core principles that will underpin the operation and management of a zero-carbon gas grid in Great Britain. It is this standard which we expect to be held to when it comes to both technical and public scrutiny of that work.



Steve Fraser, CEO, Cadent



Jon Butterworth, President,
UK Gas Transmission
National Grid Group



Mark Horsley, CEO,
Northern Gas Networks



John Morea, CEO, SGN



Graham Edwards, CEO,
Wales & West Utilities

HOW WE WILL BUILD BRITAIN'S HYDROGEN-READY GAS NETWORK

In January 2021, we published Britain's Hydrogen Network Plan. This Plan sets out the detail of the activity that all five of Britain's gas network companies will undertake in the coming years to convert Britain's world-leading gas grid to run on a mixture of hydrogen and biomethane, instead of natural gas, to help reduce the carbon emissions from our homes and businesses.

This work is split into four, broad stages:

2020

Over the next five years, we will be preparing for transition, including continuing to replace old iron-mains gas pipes with new hydrogen-ready plastic pipes, completing the safety tests, trialling 100% hydrogen in homes, and carrying out network modelling to ensure that we can continue to deliver the energy people need, when they need it the most.

This first stage will give Government the information required to make policy decisions on the conversion of networks.

2025

From 2025-30, we will start rolling out pilot schemes around the country, to turn this preparation into action. This will include bigger 100% hydrogen household pilots, replacing up to 20% of natural gas with hydrogen in certain parts of the gas network and making the changes necessary to ensure people's energy bills are accurate as they use different types of gas in their homes.

The replacement of old iron-mains pipes with new plastic hydrogen-ready ones will also continue.

2030

In the 2030s, we will scale up our work significantly. We will build new hydrogen pipelines to connect those areas of heavy industry that need to use hydrogen as a replacement for natural gas first, whilst also connecting sites to the network that can store hydrogen for when it is needed.

We will also be connecting hydrogen production sites. By now, the replacement of old iron mains with hydrogen-ready pipelines will be completed, which means we can begin rolling out 100% hydrogen conversion for use in homes, dispersed industry and transport.

2040

In the 2040s, the full transition will occur, with a national hydrogen network in place and hydrogen a normal part of training for Gas Safe engineers fitting hydrogen-boilers, cookers and other appliances in people's homes.

OUR APPROACH TO GUARANTEEING YOUR SAFETY

The engineering theory underpinning the safe use of hydrogen in place of natural gas is well established and accepted. In fact, until the 1970s around half of the gas used in Britain's gas grid was hydrogen, produced locally.

How our safety-testing process works

We secure the necessary approvals from the Health & Safety Executive (HSE) to run hydrogen trials using gas network infrastructure and the appliances that homes, businesses and industry might use in the future, doing so in specified environments and with any necessary pre-conditions on how we do that agreed. Those trials then provide evidence on how hydrogen performs in accordance with the same safety principles and standards used for natural gas grid today. That evidence is then presented to the HSE, as well as other industry experts and organisations.

Through Energy Network Association's Gas Goes Green programme, gas network companies have agreed to deliver a new joint-industry safety framework for the use of hydrogen in gas grid, to present evidence to HSE in a joined-up and coherent way. This work will then help inform the health and safety frameworks required for the widespread use of hydrogen in our energy system.

The role of our innovation projects

In the last twelve years, Britain's five gas network companies have invested £265m in over 500 different types of innovation projects across the country.

These projects are key to meeting our commitment to hydrogen safety because they allow us to use our world-leading engineering expertise to put that theory in practice, in a variety of different settings and circumstances.

When it comes to hydrogen, these projects range from testing the blending of up to 20% of hydrogen into the existing gas grid to how we will transport 100% renewable hydrogen from offshore wind turbines all the way to people's living rooms.

Working with the HSE, engineering consultancies and appliance manufacturers, the projects are using different pieces of both existing and new gas network infrastructure. They do this first in a controlled off-grid environment before moving on to limited trials in a public setting.

Projects like H21 and HyDeploy have already shown that using our gas networks to deliver hydrogen is fundamentally safe. The H100 Fife project will use renewable hydrogen, produced from a nearby offshore wind turbine, to deliver hydrogen to 300 homes from 2022.

Published in January 2021, Britain's Hydrogen Network Plan sets out how all five of Britain's gas network companies will continue to ensure people's safety in a fast moving and changing energy system, as we transition away from delivering carbon-emitting natural gas to a combination of hydrogen and biomethane instead.



OUR APPROACH TO GUARANTEEING YOUR SAFETY

How we are structuring our work

Our innovation projects fall into three areas, which broadly represent how gas is transported, distributed to and used by Britain's homes, businesses and communities. They have tested and are testing:

NATIONAL TRANSPORTATION OF HYDROGEN

The national gas grid will move hydrogen around the country. This involves testing how hydrogen can work in the high-pressure gas National Transmission System, or Britain's 'gas motorway', which is responsible for moving gas long distances to various parts of the country and for ensuring that there is enough gas in the system to meet people's needs. This work is enabling us to understand what changes need to be made to the system and how much hydrogen we will need at any given time.

This is important to ensure that our energy system remains not only safe, but also secure and reliable, so that local gas networks can distribute hydrogen to people so they can use the energy they need, whenever they need it.

LOCAL DELIVERY OF HYDROGEN

The local gas grid will deliver hydrogen to your front door. The low-pressure local gas distribution networks, or our gas 'A-roads', draw gas from the National Transmission System so they can distribute it to homes, businesses and communities in their respective areas, all the way to people's front doors. Off-grid trials have demonstrated the safety of using hydrogen in a variety of different pipelines and other infrastructure. Public network trials will shortly begin to undertake further research in a range of different settings.

This is important to ensure that hydrogen is not just safe in our homes, but on our streets and in our communities too.

HYDROGEN-READY APPLIANCES

Appliances will use hydrogen in our homes and businesses. This includes different hydrogen-ready appliances, such as household boilers, cookers and heaters, as well as commercial appliances such as industrial burners, which might be used in heavy industries such as steel manufacturing. Current gas appliances are capable of working safely and normally with up to 20% hydrogen mixed into the gas grid.

These trials are testing the safe use of 100% hydrogen for domestic appliances, with a 'hydrogen show-home' launched in Gateshead in spring 2021. They are also building on the trials to blend up to 20% hydrogen into the gas grid.

By testing a broad range of appliances in different settings, we are also supporting people and businesses' ability to choose the right zero-carbon technology for their needs – something that will become increasingly important as we seek deeper carbon emissions reductions from our households and industry.

PUTTING OUR EXPERTISE INTO ACTION

The following map sets out the key network innovation projects that are either now underway or will shortly be launched by gas network companies, summarising our safety work.

CUMBRIA FUTUREGRID

Ensuring we maintain safe & secure energy supplies.

Using real-life infrastructure to build a model that represents all the different parts of Britain's gas grid, FutureGrid will show how hydrogen can be used to ensure that we continue to receive safe and secure energy supplies wherever and whenever we need them. Beginning in 2022, this project will look at the gaps of knowledge that still exist around running the National Transmission System on hydrogen and how they can be addressed, using individual parts of gas network infrastructure, in a controlled environment. [Read more here.](#)

FIFE H100

Delivering renewable hydrogen to homes.

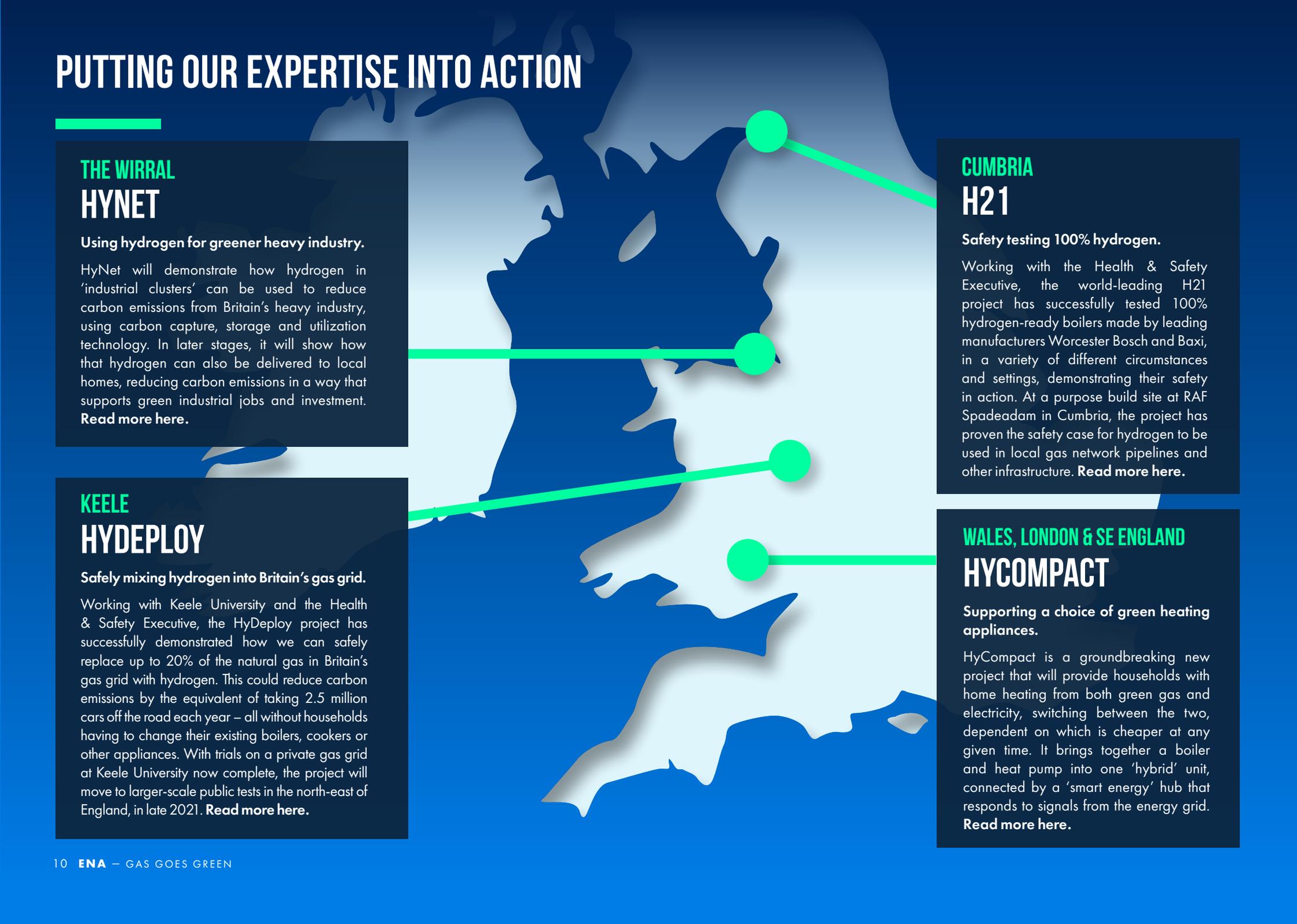
From 2022, the world leading H100 Fife project will demonstrate how hydrogen produced from renewable electricity generated by a nearby offshore wind turbine can provide 300 local homes with clean heating, hot water and cooking. In particular, this project will demonstrate safe operating procedures and instructions for workforce managing a network delivering 100% hydrogen. [Read more here.](#)

GATESHEAD HY4HEAT

Demonstrating hydrogen in action.

Led by the Department for Business, Energy & Industrial Strategy, the UK's first homes with household appliances fuelled entirely by hydrogen are sited in Low Thornley, Gateshead. The 2 semi-detached homes, funded with the help of the UK Government's Hy4Heat Innovation programme, will open spring 2021, showing how hydrogen can be used as a clean replacement to natural gas in the home. [Read more here.](#)

PUTTING OUR EXPERTISE INTO ACTION



THE WYRRAL HYNET

Using hydrogen for greener heavy industry.

HyNet will demonstrate how hydrogen in 'industrial clusters' can be used to reduce carbon emissions from Britain's heavy industry, using carbon capture, storage and utilization technology. In later stages, it will show how that hydrogen can also be delivered to local homes, reducing carbon emissions in a way that supports green industrial jobs and investment.

Read more here.

KEELE HYDEPLOY

Safely mixing hydrogen into Britain's gas grid.

Working with Keele University and the Health & Safety Executive, the HyDeploy project has successfully demonstrated how we can safely replace up to 20% of the natural gas in Britain's gas grid with hydrogen. This could reduce carbon emissions by the equivalent of taking 2.5 million cars off the road each year – all without households having to change their existing boilers, cookers or other appliances. With trials on a private gas grid at Keele University now complete, the project will move to larger-scale public tests in the north-east of England, in late 2021. **Read more here.**

CUMBRIA H21

Safety testing 100% hydrogen.

Working with the Health & Safety Executive, the world-leading H21 project has successfully tested 100% hydrogen-ready boilers made by leading manufacturers Worcester Bosch and Baxi, in a variety of different circumstances and settings, demonstrating their safety in action. At a purpose build site at RAF Spadeadam in Cumbria, the project has proven the safety case for hydrogen to be used in local gas network pipelines and other infrastructure. **Read more here.**

WALES, LONDON & SE ENGLAND HYCOMPACT

Supporting a choice of green heating appliances.

HyCompact is a groundbreaking new project that will provide households with home heating from both green gas and electricity, switching between the two, dependent on which is cheaper at any given time. It brings together a boiler and heat pump into one 'hybrid' unit, connected by a 'smart energy' hub that responds to signals from the energy grid. **Read more here.**

BUILDING BRITAIN'S HYDROGEN NETWORK

Building a hydrogen-ready gas grid in your community

Your local gas distribution network company has been investing in replacing old iron mains gas mains pipes with new hydrogen-ready pipes, made from plastic, for some time. In fact, this work first began back in 2002, to remove the risk of gas leaks from the oldest gas mains pipes, some of which dated back to the Victorian-era when the gas grid was first built.

The Iron Mains Risk Reduction Programme was introduced as a result, to deliver the investment needed to replace those old pipes. By the time this work is complete in 2032, gas network companies will have reduced emissions from transporting methane natural gas around the country by the equivalent of the carbon emissions of 526,433 cars since 2014.

Through this programme, local gas network companies have already replaced 60,000km of old iron-mains pipes with new hydrogen-ready pipelines – enough to go around the world's equator one and a half times. That's 63% of Britain's local gas networks.

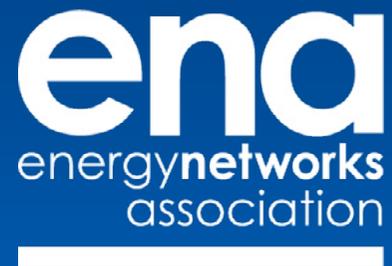
Data from Ofgem annual reports or network RIIO2 business plans. tCO₂e conversion uses the assumptions and calculation approach prescribed by Ofgem. Greenhouse Gases equivalences use EPA calculations.

BY 2032
WE WILL HAVE

ACHIEVED A
66% REDUCTION
IN CO₂e EMISSIONS SINCE 2014.

INVESTED
£28 BILLION
IN REPLACING IRON GAS MAINS
WITH HYDROGEN READY PIPES.





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