

the **HAMWORTHY**

HYDROGEN GUIDE

Understanding the hydrogen discussion



SCAN
ME

hamworthy-heating.com
sales@hamworthy-heating.com | 01202 662500



All our commercial boilers are ready for the next stage of Decarbonisation

The prevalence of low carbon heating technologies will rise significantly in the coming years, bringing big changes in how the UK's buildings are heated. Hydrogen is one of the key energy sources forming part of this conversation. With Hamworthy Heating's extensive, UK-based technical expertise in combustion technology, unrivalled market knowledge and strong customer relationships we are ready to support our customers on the journey towards hydrogen.

Government strategy and policy around the decarbonisation of heating on the pathway to net zero are evolving and changing over time. As such this document is accurate in line with our understanding at time of print.

For future updates, please keep checking our website:
www.hamworthy-heating.com

W W E I C

“We have the knowledge, experience and skills to play our part in ensuring the nation achieves its **Net Zero** targets and so our customers have the best and most advanced solutions for heating and hot water, whatever their needs and requirements.”



SHAUN EDWARDS
CEO

Contents

- 4** Introduction to hydrogen
- 7** Hydrogen economy pathway
- 8** Product identification
- 10** Hydrogen trials
- 12** Approvals & safety trials
- 13** What does this all mean?
- 14** Our role

We remain committed to our founding principles of quality, innovation, and value building – this means we’ll continue to provide unrivalled support to our customers in selecting the best heating solution for their projects, now and in the future.

omne

Introduction to hydrogen

Over the next few years, the prevalence of low carbon heating technologies will rise significantly, bringing big changes in how the UK's buildings are heated. Hydrogen could be one of the key energy sources on our pathway to Net Zero and is expected to play a part in the decarbonisation of heating in the UK.

The UK Hydrogen Strategy, published in August 2021, gives clear direction on the Government's commitment to the role this low carbon fuel source can play in meeting its target of becoming net zero by 2050 and builds on ambitions previously outlined in the Government's 10-point plan and Energy White Paper. However, it highlights the uncertainty remaining on the scale and demand we can expect to see in the future. Hydrogen is expected to form between 20-35% of the UK's energy consumption by 2050 and no final decision made on the role of 100% hydrogen in buildings until 2026 - after the hydrogen village trial in 2025.

The immediate focus is on growing the infrastructure and capability to generate, store, and distribute hydrogen, whilst in parallel creating and increasing the demand for hydrogen itself. Two key initiatives coming out of the strategy to support those researching, producing, and using hydrogen are:

The £240m Net Zero Hydrogen Fund - to provide co-investment for new production capacity.

The Hydrogen Business Model - encouraging producers with revenue support levelling up cost of hydrogen against existing fuels in the short term.

Why hydrogen?

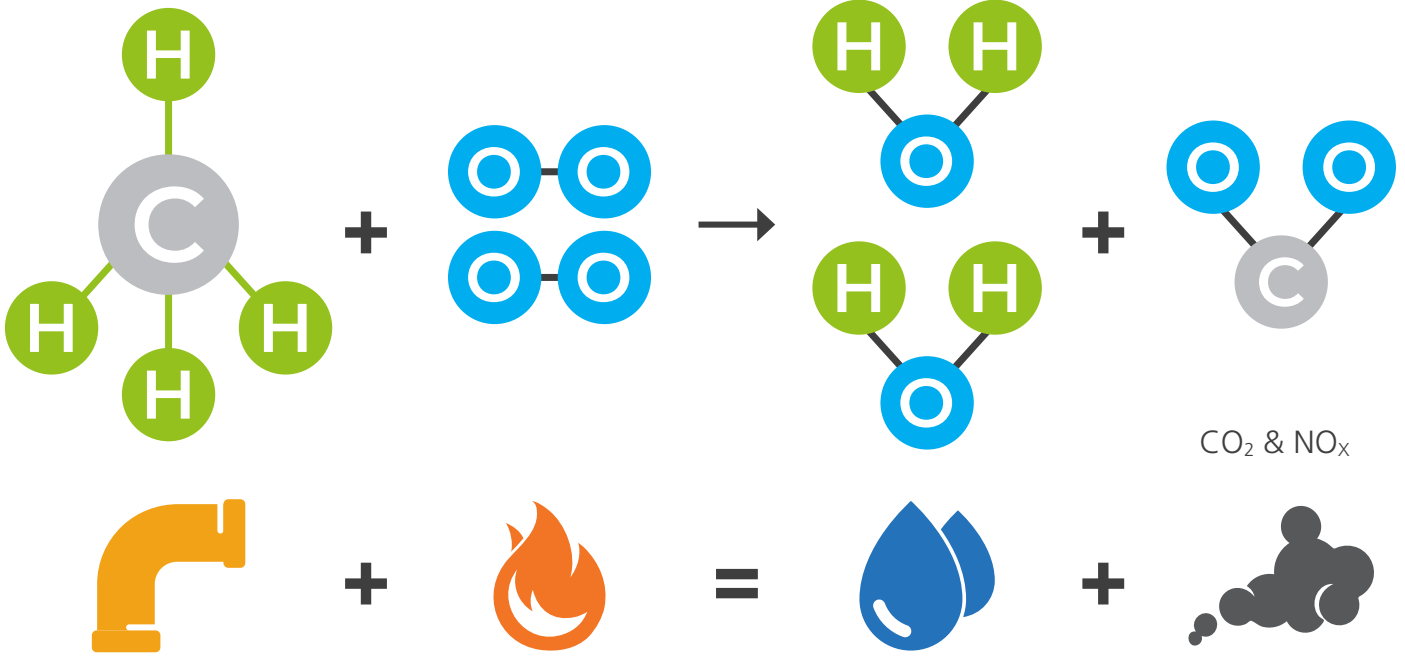
Hydrogen is seen as a key fuel in facilitating the UK's pathway to achieving its net zero goal. It offers several benefits which give it great potential as we transition to a low carbon economy. These include:

- **A green fuel source** - when burned, hydrogen creates just water vapour and heat, and produces no CO₂ emissions.
- **Easy to store** - hydrogen can be compressed, held in salt caverns or liquefied, making it easy to store for use.
- **Energy potential** - hydrogen contains a large amount of energy and gives comparable high efficiencies to condensing natural gas boilers today.
- **Utilising the existing infrastructure** - there is potential that hydrogen can utilise and be delivered using the existing gas network infrastructure, making it one of the more cost-effective routes to decarbonising heating.

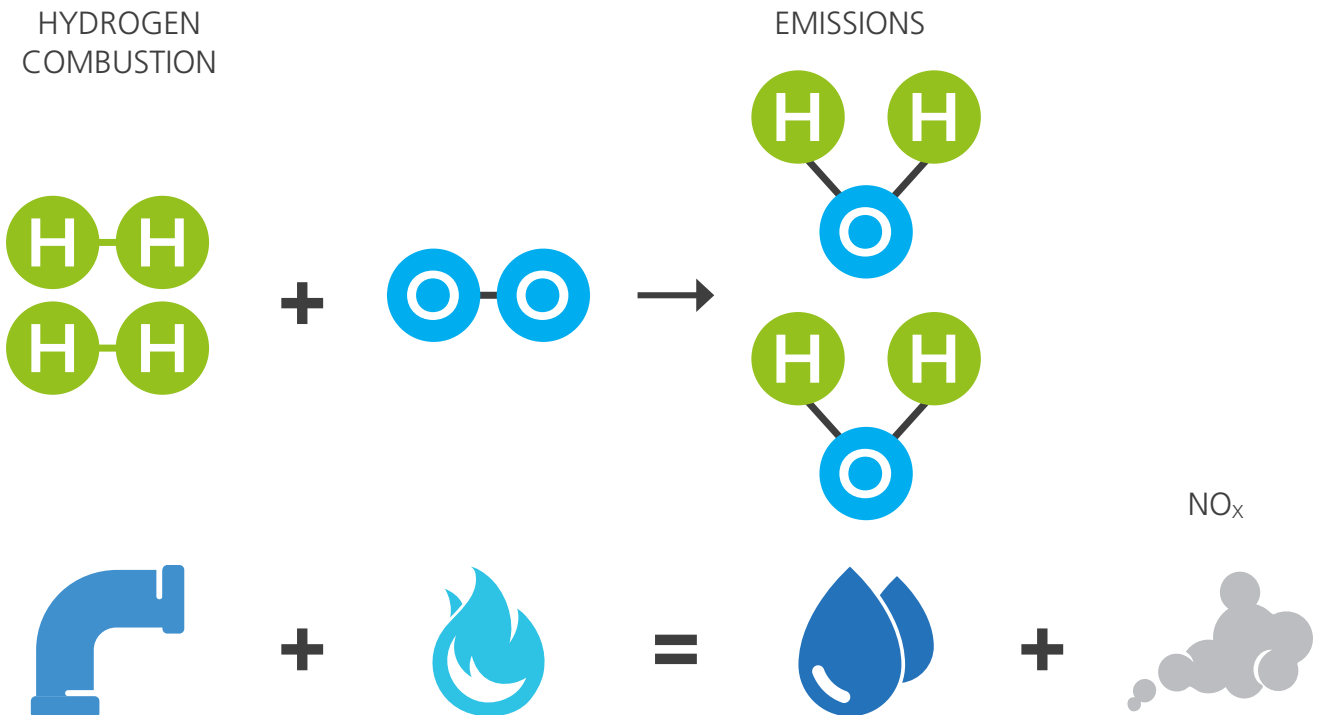


Introduction to hydrogen

METHANE/NATURAL
GAS COMBUSTION



HYDROGEN
COMBUSTION



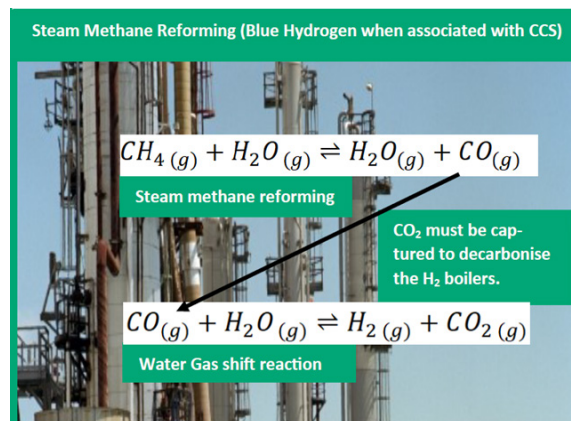
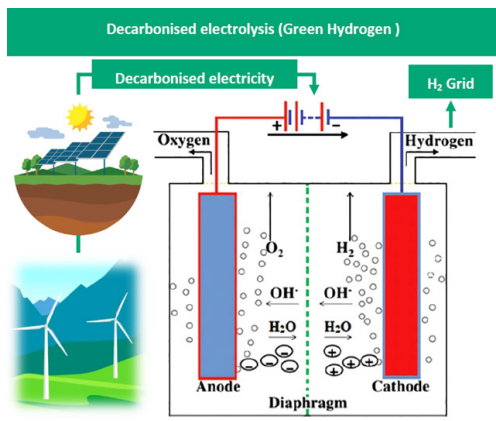
Introduction to hydrogen

Hydrogen is a “clean” gas that does not emit carbon dioxide when burned

- It can be transported like natural gas
- Burns broadly similar to other flammable gases
- Non-toxic, non-carcinogenic, non-scheduled chemical
- It has been used safely industrially for decades
- 50 million tones produced worldwide every year
- However burning hydrogen does still produce NOx emissions comparable to natural gas boilers.

Unlike natural gas hydrogen has to be manufactured which can be through:

- Electrolysis of water – green hydrogen (if decarbonised electricity is used) or blue hydrogen (if other “carbon intensive” energy is used)
- Reformation of methane (plus carbon capture, usage and storage) – blue hydrogen.



There are broadly 3 types of hydrogen boiler

✓ Hydrogen blend compatible - NOW

A boiler that can run on a blend of 20% hydrogen and 80% natural gas without changing any parts.

✓ Hydrogen-ready - tbc 2026

A boiler that can be installed and run on natural gas and can then be converted at a later date to run on 100% hydrogen.

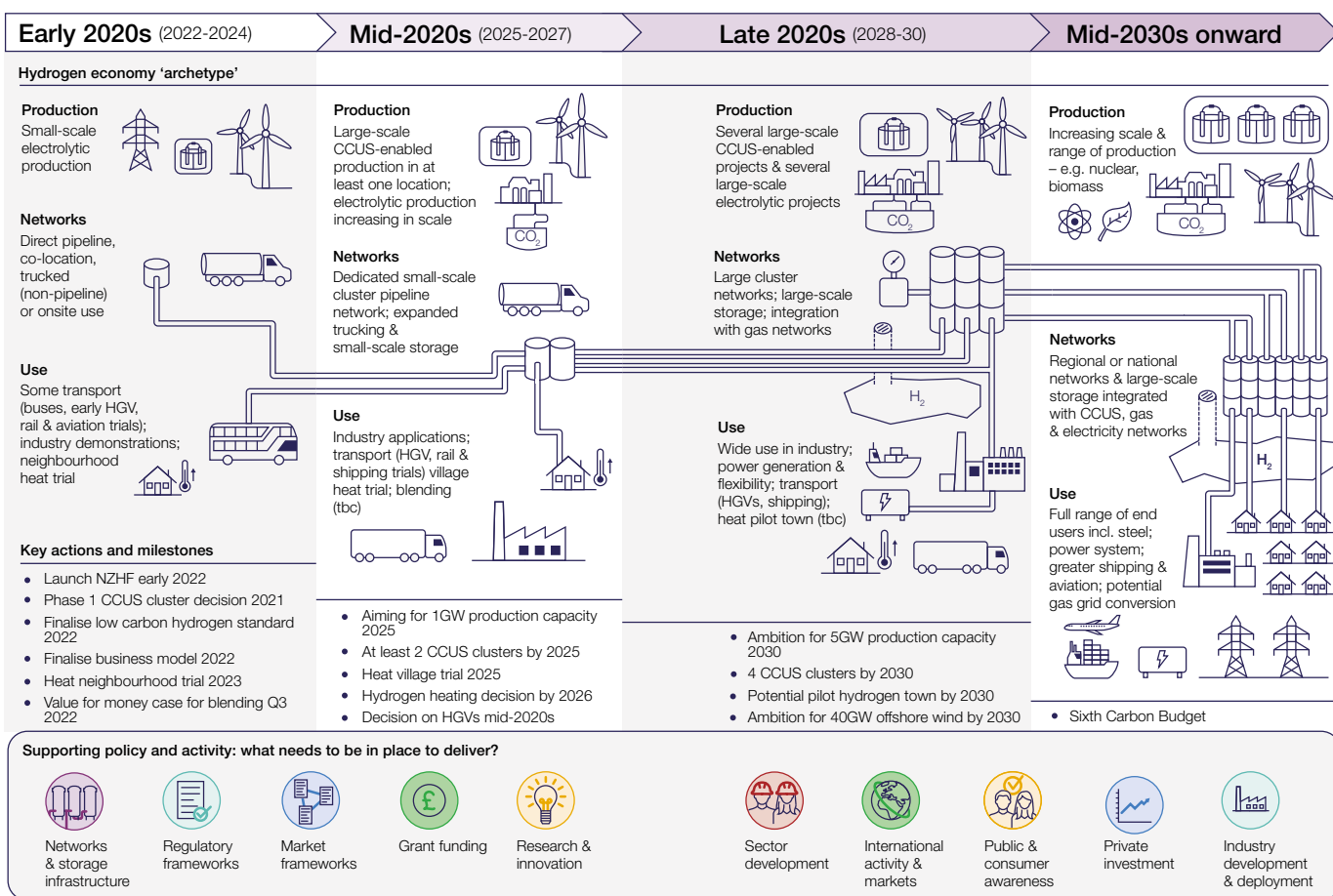
✓ 100% Hydrogen - earliest 2035

A boiler that can be installed and run on 100% hydrogen with no conversion required. In line with government ambition to phase out fossil fuels by 2035.

Hydrogen economy pathway

The UK Governments roadmap takes a 'whole-system approach' to developing the hydrogen economy, setting out how government and industry need to coordinate and deliver activity across the value chain and

supporting policy, and how this will evolve over time in areas such as Buses, HGV, Rail, Heating, Aviation, Steel, Shipping and Gas Grid Conversions.

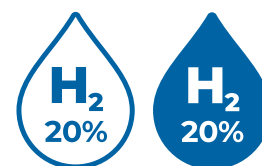


Source: UK Hydrogen Strategy https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011283/UK-Hydrogen-Strategy_web.pdf

Product identification

The use and design of hydrogen logos are now regulated - all hydrogen logos used across manufacturers should look like the below. These logos have been agreed across the commercial boiler industry to give clarification for specifiers and remove the risk of being mis-sold on product specification.

HYDROGEN BLEND



When you buy a new gas product manufacturers are communicating the benefits of being able to run on up to 20% hydrogen blend by including this logo on their websites.

Hydrogen blend refers to a mix of gasses supplied via the national grid made up of 80% methane and 20% hydrogen.

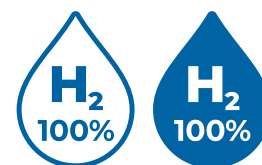
HYDROGEN READY



As hydrogen-ready appliances are placed on the market (UK Government committed to making a decision on this in 2026) they will be identified with a label that advises they are manufactured to be suitable for use with natural gas with up to a 20% blend of hydrogen. When converted by a Gas Safe registered engineer these hydrogen-ready appliances can then use a hydrogen concentration of up to 100%. (>98%). This label identifies these products.




Note: *Hydrogen-ready appliances must be clearly identified on the appliance data plate that they are certified for operation on a 100% hydrogen gas category.*

100% HYDROGEN



Any hydrogen gas appliance sold in the future for direct installation on a fully functioning 100% (>98%) hydrogen gas network without conversion will be identified with the following label.

Product identification

			
Upton	✓	<p>Currently no manufacturers have Commercial hydrogen-ready boilers ready for the market.</p> <p>Government decision on hydrogen-ready boilers will likely be in 2026.</p>	<p>Currently no manufacturers have Commercial 100% hydrogen boilers ready for the market.</p> <p>Likelihood deployment will be in the mid 2030's.</p>
Wessex	✓		
Stratton mk3	✓		
Varmax	✓		
Purewell	✓		
Ensbury	✓		
Melbury	✓		
Dorchester SG/CC/FC	✓		

*Please contact **Hamworthy** for more information on our discontinued boilers:
 Tel: **01202 662505** Email: **technical@hamworthy-heating.com**

Hydrogen trials



Hydrogen blend projects

In the UK and Europe projects such as HyDeploy and THyGA are assessing the potential to add hydrogen to the current gas networks to reduce carbon emissions and introduce a greener gas.

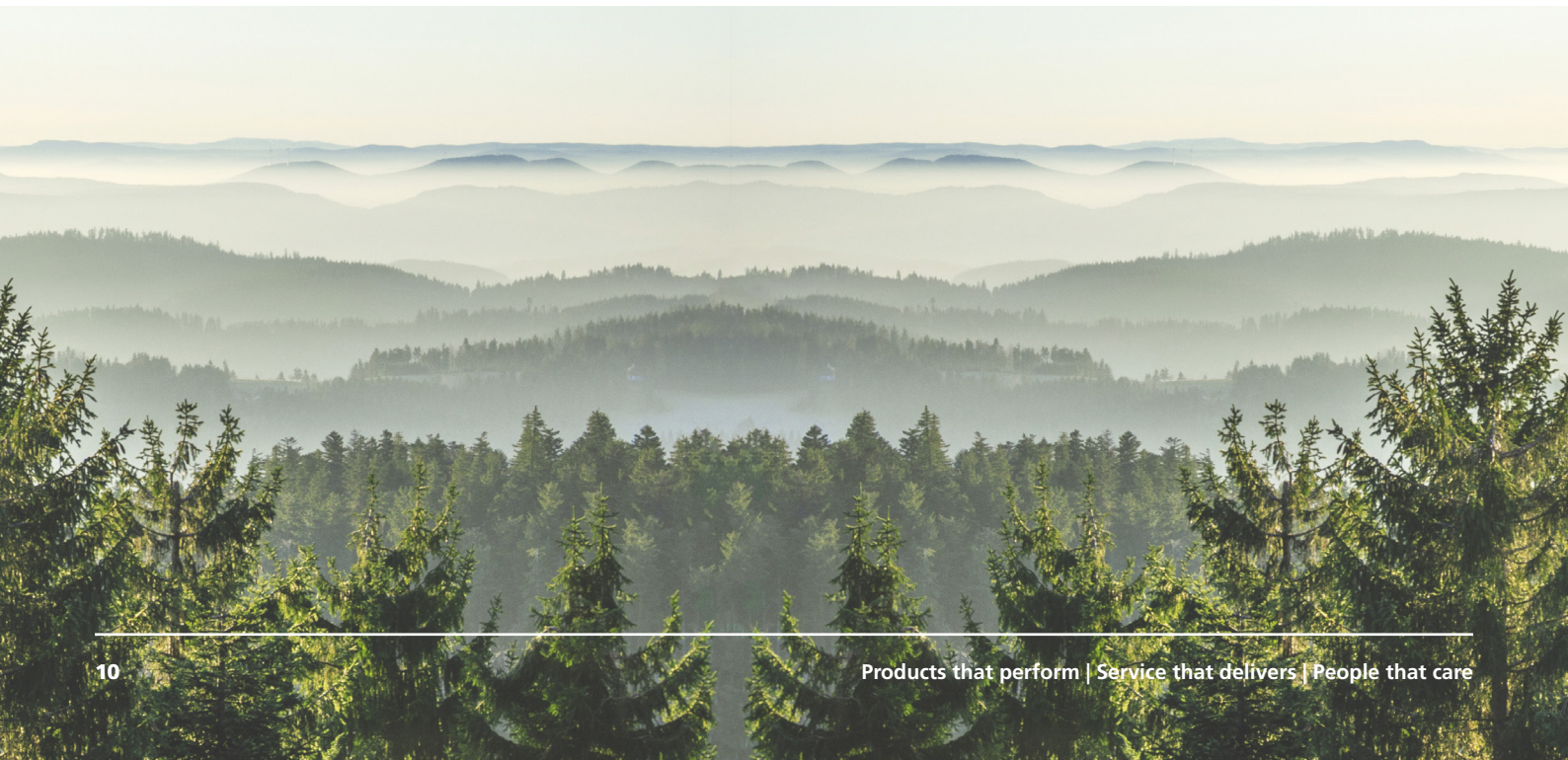
HyDeploy is based at Keele University in Stoke-On-Trent and has proved that blending up to 20% volume of hydrogen with natural gas is a safe and greener alternative to the gas we use now. It has provided evidence on how customers did not have to change their cooking or heating appliances to use the blend, which meant less disruption and cost for them. It has also confirmed initial findings that customers do not notice any difference when using the hydrogen blend. It is anticipated that no changes to products in people's homes, commercial and process plants are required, but phase two is expanding this research further to provide more evidence. In addition, there will be no changes to current working practices.

In addition to the consumer aspects, the project allows the industry to learn more about the distribution and working practices associated with hydrogen, along with production using electrolysis.

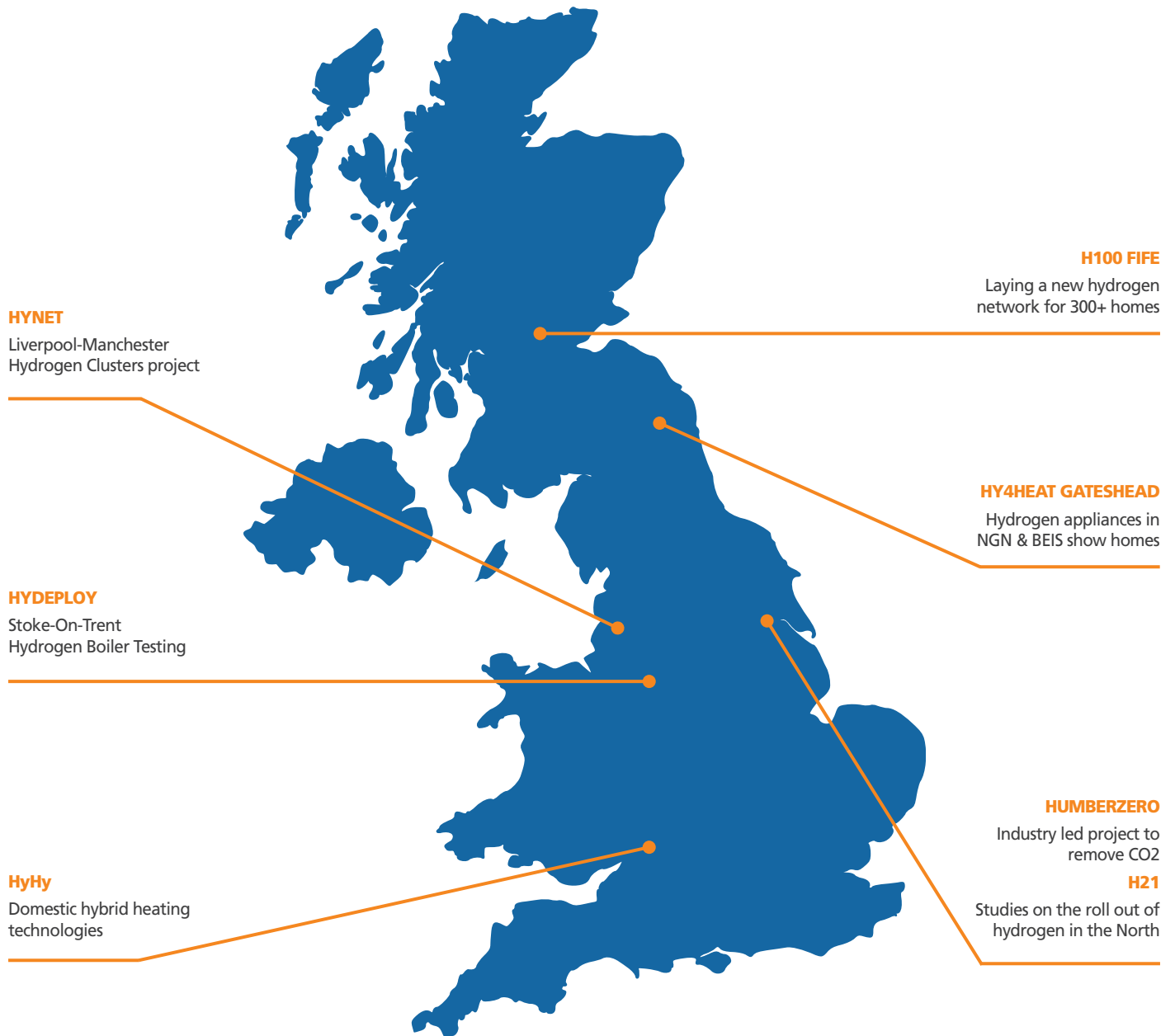


Hy4Heat – Hydrogen Appliances (100%)

The Department for Business Energy and Industrial Strategy (BEIS) has set up the Hy4Heat Research and Innovation Programme to explore a transition from natural gas to hydrogen gas for heating and hot water in the UK. The programme is intended to establish if it is technically possible, safe and convenient to use zero-carbon hydrogen gas in residential and commercial buildings and gas appliances. The H100 community project in Fife will evidence the role hydrogen can play in decarbonising heat. Up to 300 dwellings who choose to opt-in to the project will have their homes supplied with hydrogen through a new distribution network in 2023, providing zero-carbon fuel for heating and cooking. This will enable the UK Government to determine whether to proceed to a village trial phase.



Hydrogen trials



Approvals and safety testing

UKCA from 31/12/2024

Each appliance manufactured and sold today is approved and tested to the Gas Appliance Regulation. In conjunction with other regulations and harmonised European and British standards, this allows manufacturers to apply the UKCA and / or CE mark. UKCA/CE marking is a certification mark that indicates conformity with health, safety, and environmental protection requirements for products sold within Great Britain (UKCA) and the European Economic Area (CE). These requirements apply only to placing the product on the market, and thereafter the safe installation and commissioning of those appliances are the responsibility of the installer (Gas Safety Installation and Use Regulations GSIUR).

UKCA is a result of BREXIT and the requirement for the UK to have an independent certification.

Supporting Standards

Currently, installation standards for appliances are the responsibility of the British Standards Institute and IGEM. These standards will require updating to include hydrogen gas.



PAS 4444

BSI has developed a new specification, PAS 4444, to be used primarily in the Hy4Heat programme. The aim is that, along with the current European and British Standards, it forms the basis for wide-scale standardisation of hydrogen-fuelled appliances. It is an additional guide to be followed by appliance manufacturers and notified bodies regarding functionality, safety, installation, operating and servicing requirements for hydrogen-fuelled and dual-fuel hydrogen/natural gas convertible appliances.

All aspects of gas appliance manufacture currently require 3rd party certification, currently by an EU Notified Body. This includes any hydrogen gas conversion kit.

Same arrangement would continue and encompass all aspects of the convertible appliance.

Hydrogen Gas Conversion Kit Approval

It is suggested that, as part of the approval submission of a hydrogen-ready appliance, manufacturers would include in their risk assessment the hydrogen gas conversion kit and procedure, with instructions as per the Gas Appliance Regulation. The notified body would assess the suitability and safety of the conversion kit along with the risk assessment. Approval of the hydrogen-ready appliance including the conversion kit would be obligatory to allow the use of the hydrogen-ready label, and the appliance would be registered in a suitable product data base.

Quality Control Example

Hydrogen-ready appliances will be tested using current working practices for natural gas before leaving the factory. It is envisaged that, as part of the quality audit process, a number of hydrogen-ready appliances will be converted to the hydrogen mode and tested using a hydrogen supply. The audit plan will be based on a suitable Acceptable Quality Level (AQL).



Availability of Conversion Kits

Manufacturers would be responsible for approval and provision of the conversion kits. Providing details on which conversion kit fits a particular appliance along with the necessary conversion kit instructions. Suitable quality plans should be in place for suppliers of components included in the conversion kit.

What does this all mean?



In summary

Typically, any natural gas boiler currently in production could run on a blended supply of 80% natural gas / 20% hydrogen. There is currently no formal accreditation for this blend in operation other than the testing carried out under BS EN 15502-1 for boiler type approval which includes tests for natural gas operation using reference gases containing 23% or 20% hydrogen (G222 or G24).

And then more detail if you want it...

Currently work is ongoing to prove the safety cases and satisfy the HSE that the gas grid and all the appliances connected to it would be suitable to operate with a blended gas supply of 80% natural gas / 20% hydrogen. On conclusion of this work there would be no change to the majority of gas appliances connected to the grid and to the best of our knowledge all the natural gas boilers currently on the market from Hamworthy Heating are suitable for this situation. A decision would then be made at Government level if and when blending of the gas supply was to occur, assuming that sufficient volumes of hydrogen were available. Boiler products with non-adjustable gas / air ratio will automatically operate safely if switched to a 20% blend. Products with an adjustable gas valve (typically floor standing premix boilers) are also capable of operating on a blend. However, these appliances would require re-commissioning (gas valve adjustment) to ensure safe operation, due to the changing calorific value of the incoming blended gas. This would be the same regardless of manufacturer.

In regard to hydrogen-ready boilers which begin life as natural gas boilers and can then be converted to 100% hydrogen operation by the installation of a small kit of parts at a later date, the decision on whether there should be a

legislative requirement that any new installation should be hydrogen-ready is not scheduled to be made by Government until 2026. We would then expect a further period, expected to be around 3 years, to allow manufacturers to complete the necessary development and test work to create the conversion kits before the possibility that installation of hydrogen-ready boilers becomes mandatory for non-domestic boilers. In addition to the safety case there would also need to be sufficient volumes of hydrogen available to convert all or parts of the grid to 100% hydrogen supply.

As far as 100% hydrogen boilers go, there is currently no standard by which a manufacturer could type approve and place on sale in the UK market a boiler that was only intended to be fired on 100% hydrogen. There is only a provisional standard that is under development. Any 100% hydrogen boilers are, at this stage development prototypes being used for field trials and evaluations to allow the various parties to gather evidence for the potential introduction of 100% hydrogen.

Marketing activity from boiler brands

When companies are presently referring to boilers that are suitable for use on a blended supply of 80% natural gas / 20% H₂ what they typically mean is that it is a natural gas appliance that is type approved under BS EN 15502-1 and therefore has to pass a series of tests to confirm safe operation using a range of reference gases as defined in EN437. Two of these reference gases, G222 and G24, contain 23% or 20% H₂.

So essentially all boilers currently on the market could claim to be "ready" for the introduction of a blended 80% NG / 20% H₂ supply on the UK grid.

Our role



Our work towards **100% hydrogen deployment is underway**, however you need efficient and affordable heating and hot water today. Plus, it is still important to focus on reducing demand as much as possible and controlling products so that **no energy is wasted** when operating.



We will continue to provide boilers that work safely, efficiently, and operate safely on 20% hydrogen blended gas, which acts as a great stepping stone in reaching **Net Zero by 2050**.

Ultimately, we believe there will not be one fuel or technology that will dominate, but a mix. This means **you can choose the most appropriate heating and hot water system for your project**. And it will ensure the best solution for the country, environment, and your individual building's needs.



**British engineering excellence from Hamworthy Heating;
the commercial heating and hot water specialists.**



**SUPPORT BRITISH
MANUFACTURING**



Hamworthy Heating Limited

Wessex House,
New Fields Business Park,
Stinsford Road,
Poole, Dorset BH17 0NF

Tel: **01202 662500**
Email: sales@hamworthy-heating.com
hamworthy-heating.com

Hamworthy Heating Accreditations

ISO 9001 Quality Management System
ISO 14001 Environmental Management System
ISO 45001 Health & Safety Management System

Every effort has been taken to ensure the details in this guide are accurate. Hamworthy Heating does not, however, guarantee the accuracy or completeness of any information nor does it accept liability for any errors or omissions in the information.

Hamworthy Heating reserves the right to make changes and improvements which may necessitate alteration to product specification without prior notice.