

The logo for the North West Hydrogen Alliance is centered within a white circular graphic. It features the text "North West" in a small, dark font above the word "Hydrogen" in a large, bold, dark font. The letter "o" in "Hydrogen" is replaced by a red circle with a white dot in the center. Below "Hydrogen" is the word "Alliance" in a smaller, dark font. The background of the entire image is a close-up of a gas stove burner with bright blue flames, overlaid with a large white circular graphic that frames the logo.

North West  
**Hydrogen**  
Alliance

# Hydrogen Heat in the North West

[www.nwhydrogenalliance.co.uk](http://www.nwhydrogenalliance.co.uk)



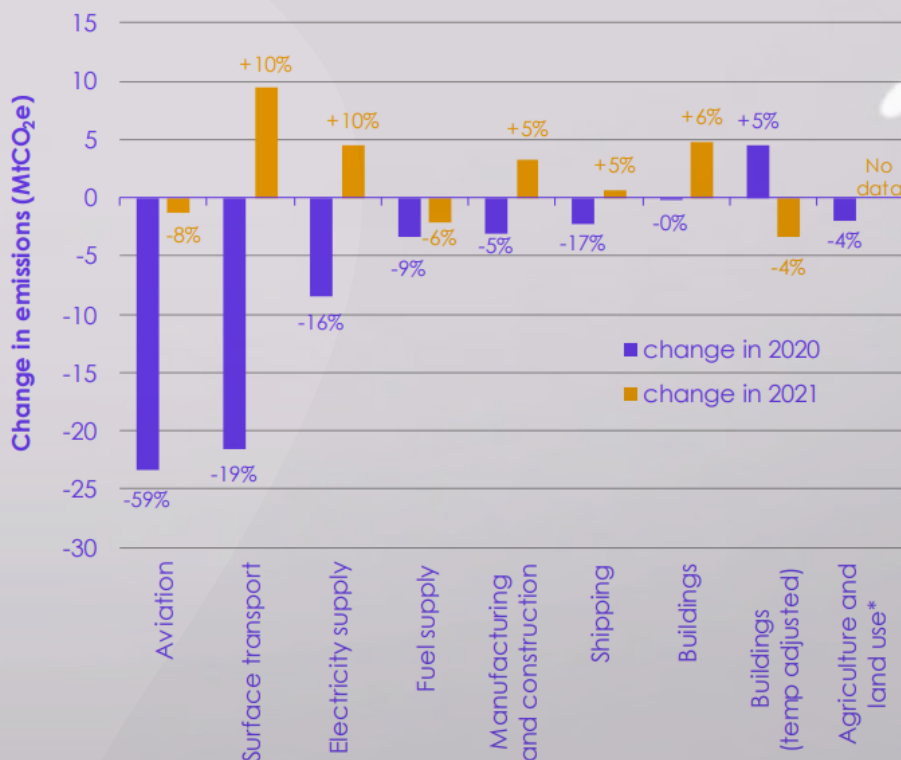
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# Background

Decarbonising domestic heat is one of the biggest challenges facing the UK as it looks to deliver on its Net Zero commitments. Heat in buildings is responsible for nearly 20% of all UK emissions and yet there has been minimal progress made in recent years.

According to the Climate Change Committee's (CCC) most recent Progress Report, emissions from buildings have increased by 6% since 2019<sup>1</sup>. There are several reasons why the UK has struggled to decarbonise this important sector. The UK has one of Europe's oldest and poorly insulated housing stocks<sup>2</sup>, making electrification more challenging to implement. The Green Living Index, designed in Germany to assess the thermal efficiency of a nation's accommodation, ranks Britain 23rd out of 28<sup>3</sup>. As such, the UK cannot rely on a single solution to decarbonise domestic heat but will need several solutions including heat pumps, hydrogen and heat networks. The cost effectiveness and applicability of these solutions is likely to vary by geography, housing density, housing type and existing fabric efficiency and as such, the UK must adopt a "horses for courses" approach, supporting all solutions to deliver decarbonisation within the domestic building sector. It is also essential that at this early stage, the UK retains optionality and takes action to ensure that the full range of solutions remains available in the future.

**Figure 1** Change in UK emissions 2019-2021 (Source: CCC Progress in reducing emissions 2022 Report to Parliament)



# Hydrogen heating in the North West

Utilising hydrogen in homes would:

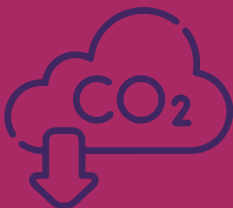


Reduce the average household emissions by **2.4 tonnes CO<sub>2</sub> per year**



Reduce an resident's carbon footprint **by 35%**

If 50% of the North West moved to hydrogen heating this would:



Save **3 million tonnes** of CO<sub>2</sub> per year, equivalent to **7.8%** of all emissions in the region

## The role of hydrogen

Hydrogen has a key role to play alongside electrification and heat networks in decarbonising



Consumer choice



System resilience



Security of supply



Low disruption



Consumer and installer familiarity



UK manufacturing jobs



## Consumer choice

The suitability of different low carbon heating solutions varies by household. Whilst decarbonising heat in the home is an imperative, it is important that consumers are given choice over the technologies that are deployed in their homes. This is likely to result in greater buy-in from consumers and will allow them to select the solution which best meets their requirements.

## Consumer and installer familiarity

85% of UK homes are currently heated using a natural gas boiler. Hydrogen boilers are a “like for like” replacement for a natural gas boiler, operating in a similar way, producing hot heat for space heating and hot water. This familiarity can be beneficial when looking to deploy solutions in the homes of consumers. Similarly, there are currently 130,000 heating engineers currently registered with Gas Safe, who install and maintain the gas boiler systems currently deployed in homes. Transitioning this workforce over to hydrogen will be relatively simple to implement.

## Low disruption

Hydrogen boilers are the same size and shape as natural gas boilers, they are able to operate using the same flow temperatures. They do not require changes in radiators or a high building fabric efficiency, they also do not require hot water storage. This means that energy efficiency upgrades, whilst essential, can be decoupled from the heating system change. This reduces the disruption in the home associated with a heating system change and means that the two financial outlays do not need to occur simultaneously. If “hydrogen ready” boilers are installed then conversion from natural gas to hydrogen requires a 30 minute visit from an installer to change three components costing in the order of £100.

## UK manufacturing jobs

The UK is well placed to be a global leader in the development and manufacturing of hydrogen boilers. The first “hydrogen ready” boilers have

been developed and demonstrated in the UK. With a strong existing installer base and manufacturing and assembling lines already in the UK for boilers, there is potential for the UK to pioneer on a global stage. The widespread roll out of hydrogen within the heat sector would create new jobs whilst importantly safeguarding existing ones.

## System resilience

The UK’s electricity distribution network has been designed and sized to match the UK power supply and demand profile. Heat is currently primarily serviced by the natural gas network - 85% of homes within the UK are connected to the gas grid<sup>4</sup>. The UK gas network, which is the world’s most extensive, currently transports 2.75 times more energy (total network capacity used domestically) annually than the electricity grid and during winter peaks it can transport up to 10.6 times more. Whilst the electricity network will inevitably need to be upgraded to support the electrification of transport, attempting to additionally service the entire heat domain utilising the electricity network is likely to present challenges. Utilising the existing natural gas grid to transport hydrogen will result in a more resilient energy system and relieve the pressure on the electricity grid which is typically expensive to upgrade.

## Security of supply

Heat is responsible for almost half of UK final energy demand. Ensuring security of supply in this sector is essential for ensuring that homes are kept warm in winter. In addition, winter peak demands can be over 200GW during extreme weather events. Hydrogen offers a mechanism by which to store energy during the summer, when heat demand is low, and utilise it in winter, thereby reducing supply constraints. Similarly, the use of CCUS enables us to diversify our energy sources and utilise our natural gas resources alongside our renewable generation assets.

<sup>4</sup> Department for Business, Energy and Industrial Strategy (2022), Decarbonising Heat in Homes

# What has been done to date?

There has been much progress in the UK's development of hydrogen heating solutions. This has ranged from demonstrating the technical and safety case of hydrogen heating, to the development of hydrogen ready boilers and appliances. The North West is at the forefront of the latest developments in hydrogen heating, delivering the detailed designs of the world's first Hydrogen Village.

## 1. Hy4Heat – Developing hydrogen appliances and demonstrating the safety and technical case

Hy4Heat demonstrated that it is technically possible, safe and convenient to replace natural gas boilers with hydrogen boilers in residential and commercial buildings<sup>5</sup>. The programme resulted in the development of “hydrogen ready appliances” including boilers, meters, cookers and fires. These products have now been tested in two unoccupied “Hydrogen Homes” in Low Thornley, further demonstrating the technical and safety case for hydrogen heating.

The programme saw recommendations into hydrogen quality standards and the completion of a safety assessment showing the use of 100% hydrogen for heating is as safe as natural gas in most common domestic buildings.



## 2. Hydeploy

Hydeploy demonstrated how blended hydrogen can be used safely in existing pipelines and appliances. The first trial took place at Keele University on a private gas network where the campus received blended gas between November 2019 and March 2021. The trial confirmed that existing appliances can utilise a blend of 20% without needing to be modified in any way.

The second trial took place in Winlaton near Gateshead. The trial took place from August 2021 for 10 months and supplied 668 houses (and other establishments) with a 20% hydrogen blend. The conclusions of this project showed that a 20% hydrogen blend could be used in existing pipelines and appliances with little disruption and that if this blend was to be rolled out across the UK, carbon dioxide emissions would be reduced by six million tonnes – the equivalent of taking 2.5 million cars off the road.



## 3. H100

Currently underway, the H100 project is the world's first green hydrogen to homes heating network on the Fife coast<sup>6</sup>. The project undertaken by the Scottish Gas Network (SGN) will heat around 300 local homes using clean hydrogen produced by a dedicated electrolysis plant powered by a nearby offshore wind turbine. The project will bring renewable hydrogen into the homes of residents of Buckhaven and Methil in 2023. The system will be built to ensure the same high safety and reliability standards expected from the current gas system and on-site storage will ensure supply throughout inter seasonal demand. The construction will begin in 2022 with the project being operational from 2023 to 2027.



<sup>6</sup><https://www.sgn.co.uk/H100Fife>

# What happens next?

Much progress has been made to demonstrate that the use of hydrogen in homes is both technically feasible and at least as safe as current solutions. The next step is to demonstrate that this solution can be rolled out at scale by converting the existing natural gas network.

## Hydrogen Village Trial – Whitby, Ellesmere Port

The UK government has committed to supporting the delivery of a 100% hydrogen village trial by 2025. Two locations have been shortlisted to be the first UK Hydrogen Village, one of which is Whitby in Ellesmere Port in Cheshire. In this area up to 2000 homes would stop using natural gas for cooking and heating and use hydrogen instead. Each participating home would have all existing gas appliances replaced for free, including a hydrogen ready boiler. During the two-year trial, households would pay the equivalent unit cost for hydrogen as they would for natural gas.



## Mandating “Hydrogen Ready” Boilers

“Hydrogen Ready” boilers are boilers that can utilise natural gas until hydrogen is available at which point they can be converted in 30 mins at a cost of £100 to use hydrogen. There are approximately 22 million boilers in the UK with currently 1.6 million new installations a year meaning retrofitting the entire existing stock of gas boilers would take just under 14 years. In July 2021, the big four boiler manufacturers (Baxi, Worcester Bosch, Vaillant and Ideal) confirmed that a hydrogen-ready boiler will cost no more than a natural gas boiler. In the Hydrogen Strategy the Government committed to consulting on mandating that all new boilers sold from 2026 are “hydrogen ready”. This is a no regrets action that will significantly reduce overall cost of conversion and disruption to the homeowner.





## **Commitment from Government to hydrogen heat**

The UK cannot cost effectively decarbonise its housing stock without hydrogen. The Government has stated that it will make a decision on the future of the gas grid, and therefore hydrogen heating, in 2026. Industry needs clarity from Government on the framework for that decision. Considering the length of time these projects take to propose, design, implement and operate, clarity is also needed on the rollout of hydrogen heat post 2026. This will enable industry to prepare and invest early in the infrastructure and manufacturing capabilities required to deliver hydrogen for heat.

## **2030 Hydrogen Town**

The government had laid out the aim for a pilot Hydrogen Town by 2030 following a positive decision on hydrogen for heat in 2026. Similar to the 'Hydrogen Village', Gas Distribution Networks will be able to submit applications proposing viable locations within their respective networks. The project will be an expansion of the Hydrogen Village project with the town being heated by 100% hydrogen distributed in gas pipelines.

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