
Wales & West Utilities
Decarbonising South Wales Industry
WALES&WEST
UTILITIES
DE CYMRU
CLWSTWR DIWYDIANNOL
SOUTH WALES
INDUSTRIAL CLUSTER

Introduction

South Wales is one of six industrial cluster regions responsible for creating around a quarter of the UK's total emissions. The region is also a net energy producer, with the capacity to export both electricity and gas to the rest of the UK. Wales also has the potential to export hydrogen, positioning it as a frontrunner in the journey to net-zero.

To deliver on our ambitious climate targets by 2050, we need to change the way we use, store, convert and transport energy. Every sector will need to go through significant changes, including the gas and electricity networks. As part of this, decarbonising heavy industry needs to be a priority.

Industrial clusters are areas with a number of industrial sites.

For instance those producing:

Our Net-Zero Ambition

Wales & West Utilities is a partner in the South Wales Industrial Cluster (SWIC). We are working with our industrial customers to switch their fuel from natural gas to hydrogen and eliminate CO2 emissions.

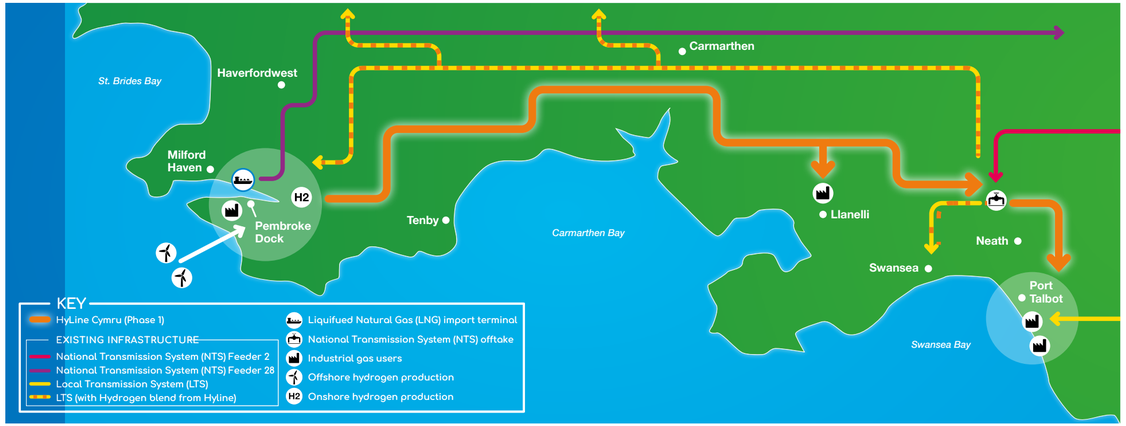
To manage the transition and ensure both our domestic and industrial customers maintain a safe, reliable, and resilient supply, we will be repurposing the majority of the existing grid for hydrogen.

Several projects are already underway, demonstrating how we can repurpose the grid for green gas, as a cost-effective way to decarbonise. One of these projects is Regional Decarbonisation Pathways (RDP).

This is our plan for converting the network to hydrogen and has allowed us to plan for a large-scale hydrogen rollout from 2030 onwards – driven by industry in South Wales.

In November 2022, we launched HyLine Cymru. The project explores the possibility of building the first hydrogen pipeline in Wales. The pipeline would offer an opportunity for Wales to become self-sufficient in low-carbon heat from hydrogen and could help the nation reach its exportation potential to the UK and the rest of the world.

We have the evidence and business case to make this a success, but we need wider support from government and industry to make this happen.



Existing Demand and Challenges

Whilst we know that much of industry is reliant on gas for high-temperature processes, we also know that 40% of electricity is supplied by the gas network and relies on this network for resilience during periods of high demand (such as in the 'Beast from the East' storm of 2018).

Domestic heat for our homes mainly comes from gas too – with 86% of homes having a natural gas boiler. This is a huge demand on the gas network, and if changed to a heat pump, could mean a huge demand on the electricity system too.

Figure 1: Main fuel type used in central heating, Wales, up to March 2022

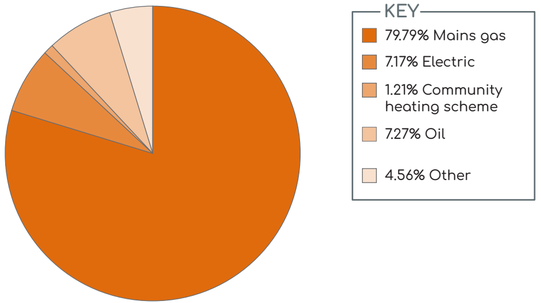
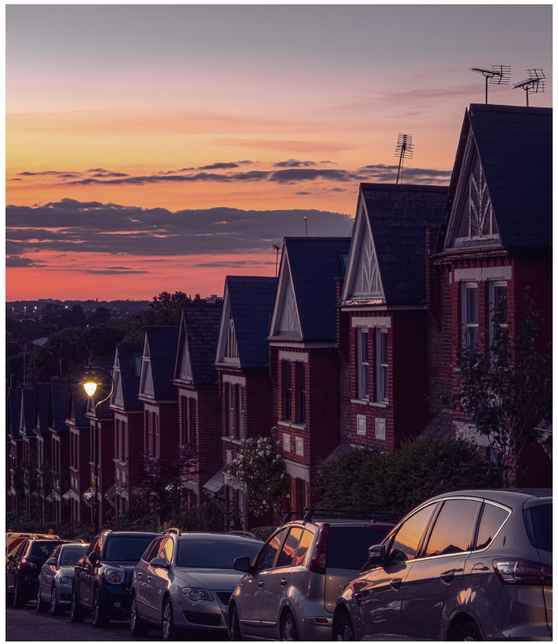


Figure 1 shows the proportion of homes in Wales using different sources of heat up to 2022. Notably gas central heating is used to heat 79.79% of homes in Wales.



This is why an electrification-only solution isn't enough. Joint repurposing of gas and electricity networks for green energy is key to the decarbonisation of industrial and domestic heat demand. Overall energy consumption is likely to rise over the next three decades, which presents an increased challenge of operating the energy system with greater variation in weather and demand.

To reach our net-zero targets and decarbonise the gas network, a whole-systems approach is needed. A low carbon hydrogen grid will provide greater flexibility to manage the variable load and demand, whilst ensuring security of supply to our customers and supporting the electricity grid.

Figure 2: Multi-vector Energy Diagram for Great Britain GWh per day

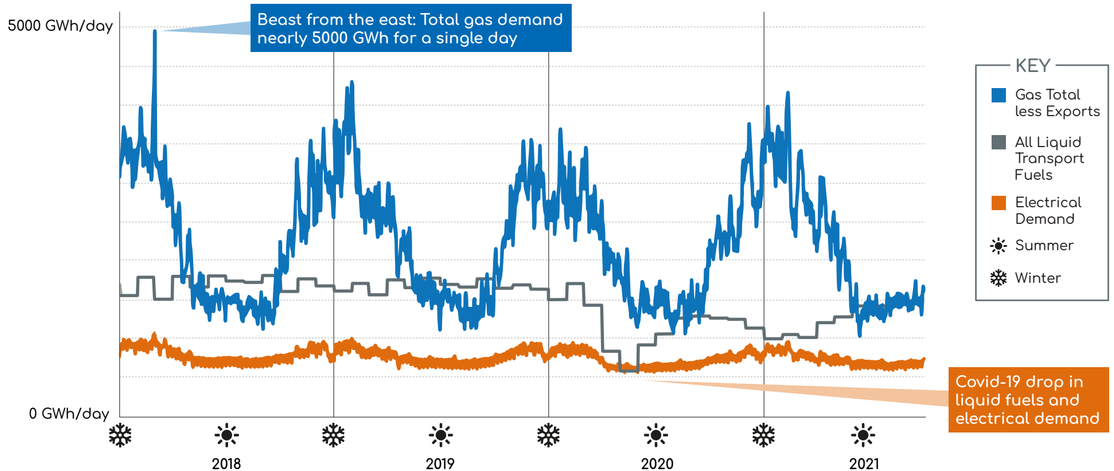


Figure 2 created by Dr Grant Wilson: i.a.g.wilson@bham.ac.uk. Energy Informatics Group, University of Birmingham slidepack available from https://doi.org/10.5281/zenodo.3930970 Underlying data are from the National Grid, Elexon and BEIS.

> Demand scenarios for South Wales have helped define how we will meet future energy demand with varying degrees of hydrogen over time.

A little more about us...

Our projects

Meeting Demand

Decarbonisation of homes and industry is a huge challenge, with each sector facing a multi-faceted problem in reducing energy consumption, whilst also switching from greenhouse gas emitting sources.

A combination of electrically driven heating systems (heat pumps, electric resistive heating), heat networks or the distribution of hydrogen are the mostly likely options for the future.

The UK's decarbonisation efforts through innovation and energy efficiency measures are likely to offset the rise in energy demand due to population growth. This means that overall energy demand levels are expected to remain static in future.

Demand scenarios for South Wales have helped define how we will meet future energy demand with varying degrees of hydrogen over time. Three scenarios have been developed through our Regional Decarbonisation Pathways work, showing heat supplied to our industrial and domestic customers will change between now and 2050:

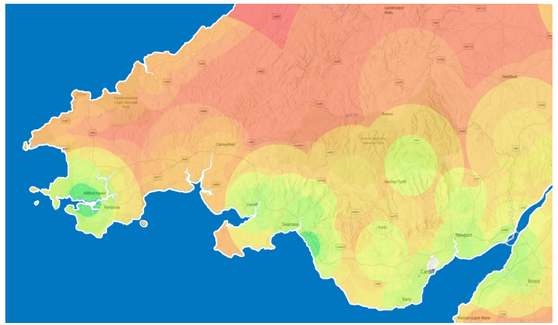
- Low Hydrogen – relative to demand / supply by 2030
- Medium Hydrogen – relative to demand / supply by 2040
- High Hydrogen – relative to demand / supply by 2050

> "Decarbonisation of homes and industry is a huge challenge, with each sector facing a multi-faceted problem in reducing energy consumption, whilst also switching from greenhouse gas emitting sources."

Hydrogen Production

Hydrogen can be used to replace existing natural gas supplies, initially via a hydrogen blend, with the aim to convert to 100% hydrogen in future.

Figure 4: Potential Blue Hydrogen Production Locations



Milford Haven and Port Talbot have been identified as key locations for low carbon hydrogen production in South Wales. Both areas offer:

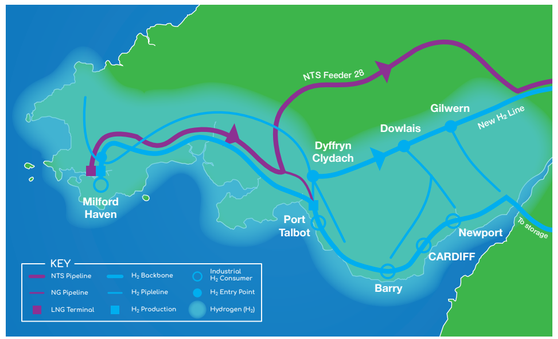
Transportation

The existing electrical system in South Wales has less capacity than the gas system, with minimal headroom for additional capacity in future. To transition, new system infrastructure would be required.

We've demonstrated that the existing gas system has the best capacity to meet net-zero demand.

WWU's network, alongside the National Transmission System (NTS) and Project Union, can be used to transition from natural gas to hydrogen whilst still supporting gas consumers elsewhere in the UK and Europe. The area around Milford Haven has strong credentials for the production of hydrogen and has been highlighted by SWIC as an early opportunity from which the Welsh hydrogen economy can grow. This is why we are exploring a new pipeline link between Milford Haven and Swansea to help facilitate the transition of industry to clean fuels, whilst mitigating the need for a dedicated hydrogen production facility in Port Talbot.

Figure 5: Schematic of the high pressure pipeline network circa 2050



Hydrogen Production

Storage

The gas network provides in-day and seasonal energy storage to heat demand, whilst also providing the main source of resilience and security of supply to the electricity system. Local storage will also be required for the first projects of the hydrogen transition phase.

The gas grid offers greater capacity than other technologies to store energy, especially those that are linked to the electricity network.

This could be by the supply of hydrogen by road in compressed form or as liquids in carrier molecules. Longer term, we have been looking at the possibility of a hydrogen-specific national transmission system to connect to storage elsewhere in the UK via our Salt Caverns project.

Hydrogen for Power Generation

Flexible generation sites, also known as gas peaking plants, provide additional power to the electricity system when needed. As variable renewables increase, so has the number of flexible generation sites.

Most sites are connected to the intermediate pressure (IP) and medium pressure (MP) gas networks. The energy carrying capacity of hydrogen is approximately one third that of natural gas, so higher flows of gas are needed to supply these facilities.

Whilst this presents no major issues, we may need to reinforce parts of the network to ensure minimum supply pressures are maintained for hydrogen.

Hydrogen will need to play a role in meeting and decarbonising future energy demand – both on a domestic and industrial level.

Existing and future electrification capacity will not ensure resilience and security of supply, especially considering weather and the variability of demands.

Wales is uniquely positioned to produce, transport, and store hydrogen within the UK and further afield. The nation also offers opportunities in power generation to support other fuel infrastructure.

If we are to help Wales realise its potential in the future of energy, we will need the combined support of government and the wider industry to benefit all sectors and deliver a just transition.

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