

NI GAS
NETWORK
PATHWAY
TO

NET

ZERO

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Overview: The benefits of a Net-Zero Gas Network

Industry

- Supports the decarbonisation of NI Business – 54% of 2021 Gas Distribution Network Demand¹
- Enhances NI firm's competitiveness in a global trading environment where reducing the carbon output required to produce and transport products is becoming increasingly important

Homes & Buildings

- On-gas grid consumers will be able to take advantage of a Hydrogen and Biomethane based decarbonised heating solution
- Decarbonising the gas supply does not require consumers to radically change their behaviour or carry out an expensive retrofit of their home

Transport

- Renewable gases can be used as a replacement for diesel in hard to electrify transport sectors such as HGVs, agricultural machinery etc.
- The decarbonisation of HGV fuel will in turn support the decarbonisation of NI's logistics sector and ultimately NI firm's supply chains

Power

- 55% of 2021 total NI natural gas consumption was used to generate electricity⁴
- Renewable gases conveyed by the Gas Network will facilitate the development of the necessary zero-carbon standby generation to ensure NI's lights remain on when wind/solar isn't available

Agriculture

- Producing Biomethane from agricultural manure and underutilised grassland is an opportunity for NI's large agriculture sector to diversify
- 2021 NI Agri-Food Sector Report stated that using slurry for Biomethane production was vital for the livestock sector to continue to operate²

Decarbonisation & Environment

- Decarbonising the Gas Distribution Network will reduce NI CO₂ emissions by c.1.4 million tonnes per annum (based on 2021 demand)⁵
- Routing agriculture manure through Anaerobic Digesters to produce Biomethane supports better nutrient management in NI's agriculture sector

Green Growth

- Indigenous production of renewable gases will create jobs - especially in rural areas. KPMG estimate that over 1000 direct and indirect jobs are created for every 1 TWh of Biomethane produced³
- Supports DfE Energy Strategy target of doubling the renewable energy economy by 2030

Whole System Benefits

- Unlike electricity, renewable gases are suitable for large-scale, long-duration, storage
- The ability to store energy reduces overall energy system costs by allowing excess renewable gas produced in the summer to be used in the winter - providing greater flexibility and resilience

Introduction

Since 1996, Northern Ireland's modern gas network has delivered significant carbon savings to homes and businesses across the region. It will continue to evolve to become Net-Zero by 2050.

The gas industry recognises that whilst natural gas will play a key bridging role in Northern Ireland's journey to Net-Zero, the NI Gas Network must transition away from the distribution of natural gas to renewable gases like Hydrogen and Biomethane.

The NI Gas Network Operators (GNOs) – Mutual Energy, GNI (UK), SGN Natural Gas, firmus energy and Phoenix Natural Gas – are actively preparing for this transition and have developed a Pathway to Net-Zero.

At the heart of our pathway is an affordable, least-disruptive, transition to Net-Zero where energy users can continue to enjoy all the convenience and benefits of a gas heating system safe in the knowledge that the gas they use will be 100% renewable by 2050.

This is an exciting time for the NI Gas Network and we are enthusiastically looking forward to working with consumers and energy stakeholders to play a full role in Northern Ireland's journey to Net-Zero.



The NI Gas Network – Background

One of the most modern in Europe, Northern Ireland's gas network has expanded rapidly since it was launched 25 years ago.

Natural gas was first introduced to Northern Ireland via the SNIP (Scotland to NI gas pipeline) in 1996. The network was initially constructed and operated by Phoenix Natural Gas in the Greater Belfast area with further distribution licences granted to firmus energy and SGN Natural Gas to progressively expand the gas network westward in 2005 and 2015.

Today, the distribution pipeline network stretches over 6,000 kms. The distribution network is supported by a large volume transmission network managed by Mutual Energy and GNI (UK) which supplies gas to the individual

distribution networks and Northern Ireland's gas-fuelled power stations. In total, the NI Gas Network represents a £1 billion investment which supplies natural gas to consumers in every major urban centre in Northern Ireland.

Over the past 25 years the number of domestic and non-domestic connections has expanded dramatically. By the end of 2022 c.320,000 properties will be connected to the gas network – c.40% of all NI homes.

However, the NI Gas Network has not yet reached its full potential - c.70% of all NI homes. We will continue to spread the lifestyle advantages and carbon benefits associated with switching from oil to gas to the c.230,000 properties which are passed by a pipeline, but not yet connected, and in doing so provide gas users with a pathway to a Net-Zero energy future.

Fig 1. Map of the NI Gas Network

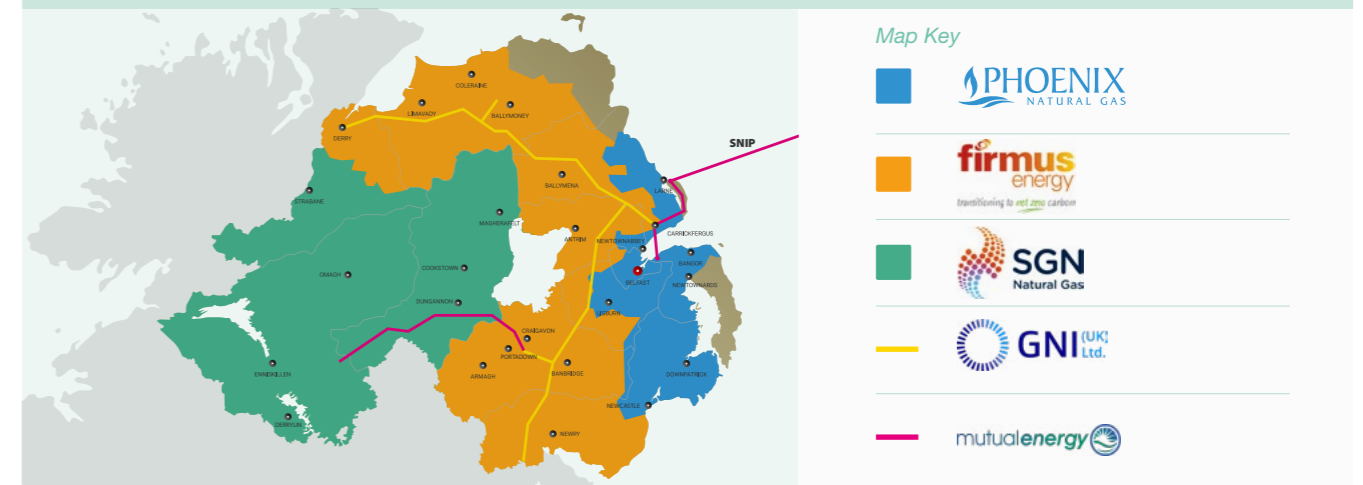


Fig 2. Gas Network connections

As at 31 Dec 2022	PNG	firmus	SGN	Total
Properties Passed	355,000	170,000	25,000	550,000
Properties Connected	250,000	60,000	9,000	319,000

The NI Gas Network represents a £1 billion investment which supplies natural gas to consumers in every major urban centre in Northern Ireland

The NI Gas Network is evolving to meet the challenge of decarbonisation

Northern Ireland's modern gas network already delivers significant carbon savings to homes and businesses across the region.

Natural gas is a less carbon intensive fuel than oil, and by replacing older, inefficient, heating systems with a highly efficient gas boiler and associated heating controls, consumers can displace up to 48% of their home energy carbon emissions.⁶ Due to these advantages, in 2021, NI natural gas users collectively prevented over a million tonnes of CO₂ from entering the atmosphere – the equivalent of taking c.500,000 cars off NI roads each year.⁷

Furthermore, we are committed to the promotion of energy efficiency measures to both our existing, and prospective, customers. Our qualified Energy Advisers carry out over ten thousand energy audits with householders each year – reviewing the energy efficiency measures already in place, suggesting improvements and signposting householders to schemes that might help support their needs.

However, we are also focused on the need to decarbonise the gas network

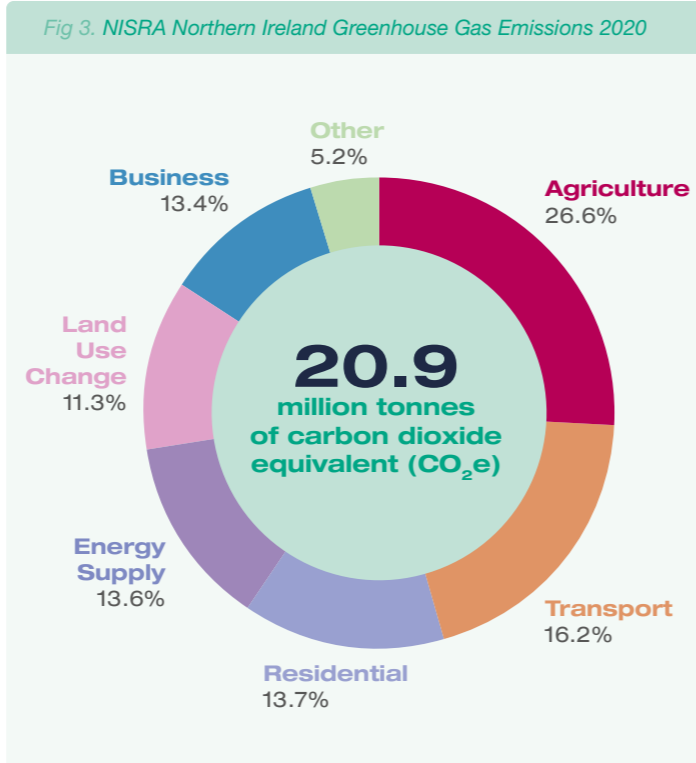
Despite the clear benefits of switching from oil to gas, the gas industry recognises that natural gas, as a fossil fuel, will only play a bridging role in Northern Ireland's pathway to Net-Zero.

It is for this very reason that we are preparing to transition the NI Gas Network away from natural gas to renewable gases like Biomethane and Hydrogen.

With its modern plastic pipes suitable for re-purposing to renewable gases, Northern Ireland's £1 billion Gas Network is a strategically important asset that will support the decarbonisation of multiple sectors by replacing the natural gas currently flowing through the gas grid with Biomethane and Hydrogen.

This includes supporting the decarbonisation of:

- The residential and business sectors (representing 27.1% of NI's 2022 emissions)
- The transport sector (representing 16.2% of NI's 2022 emissions) by supplying Hydrogen and Biomethane
- The agriculture sector (representing 26.6% of NI's 2022 emissions) by reducing livestock emissions through the production of Biomethane
- The power sector (representing 13.6% of NI's 2020 emissions) by supplying Hydrogen and Biomethane to fuel dispatchable generation supporting intermittent renewable electricity generation



The Gas Network's role in Northern Ireland's wider pathway to Net-Zero

The Department for the Economy's (DfE) publication of the Northern Ireland Energy Strategy "The Path to Net-Zero Energy" in December 2021 was warmly welcomed by the gas industry.

The DfE Energy Strategy identified three key targets to facilitate the Executive's aim to reduce regional energy-related emissions by 56% by 2030. We believe the NI Gas Network will play a key role in the delivery of all three targets:

1 Energy Efficiency: Deliver energy savings of 25% from buildings and industry by 2030

- One of the easiest ways to reduce domestic energy consumption in Northern Ireland is to ensure that households are equipped with modern, highly efficient boilers with advanced controls to help reduce energy usage - and in turn carbon emissions - in households.
- The GNOs will continue to encourage energy users to review their energy efficiency measures, suggest improvements and signpost them to available support schemes.

2 Renewables: Meet at least 70% of electricity consumption from a diverse mix of renewable sources by 2030

- NI wind generators are expected to face significant levels of curtailment – 10-20%⁸ - as more and more renewable generation is installed to reach the 2030 electricity consumption target – increased to 80% by the 2022 NI Climate Change Act.
- Curtailment leads to less revenue for renewable generation and without mitigation can impact the viability of both existing and future renewable energy projects. Investing in indigenous electrolyser capacity would allow any curtailed electricity generation to be converted into Green

Hydrogen – with the NI Gas Network acting as a potential source of ready demand.

3 Green Economy: Double the size of our low carbon and renewable energy economy to a turnover of more than £2 billion by 2030

- Northern Ireland has historically been a gas importer with the jobs associated with gas production all located elsewhere.
- The transition to utilising renewable gases in the Gas Network offers Northern Ireland the opportunity to grow its green economy by investing in indigenous renewable gas production - supporting economic growth and job creation across the region.
- KPMG analysis suggests that over 1000 direct and indirect jobs are created for every 1 TWh of Biomethane produced.⁹



"As natural gas has lower emissions than oil we will continue to encourage people with access to the gas network to connect to it."

"We also intend to utilise our modern gas infrastructure and the potential to generate and import zero carbon gases. We will continue to engage with gas network operators on replacing natural gas with renewable gas."

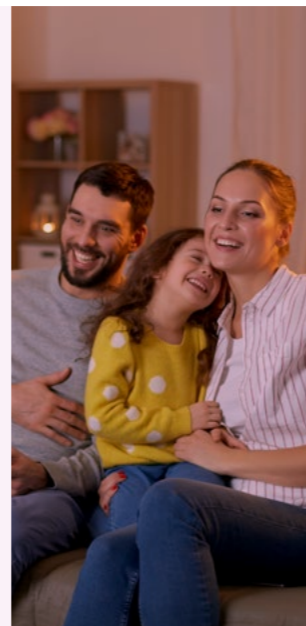
— "The Path to Net-Zero Energy"

Why the Gas Networks will play a key role in Northern Ireland's pathway to Net-Zero

Offers consumers a less disruptive, more affordable, pathway to decarbonising their home heating:

On-gas grid consumers will be able to take advantage of a Hydrogen and Biomethane based decarbonised heating solution that is affordable, does not require consumers to radically change their behaviour, or carry out an expensive retrofit of their home.

- Electric heating solutions will play an important role in Northern Ireland's pathway to Net-Zero – especially in rural areas where the gas grid will never reach – but they will not be the best choice for every home and it's important that sufficient optionality is retained to allow consumers to pick the decarbonisation solution that best suits them.
- Hydrogen-ready boilers will be the same price as traditional gas boilers and the switchover process will entail minimal disruption - the necessary decarbonisation takes place upstream from the consumer.¹⁰



Offers an opportunity to utilise gas network demand to kickstart Northern Ireland's Hydrogen economy – supporting other sectors' transition to Net-Zero

The NI Gas Network can act as a potential ready source of demand to unlock early production of Hydrogen.

- Unlike Great Britain, Northern Ireland does not have a large industrial sector which can drive early demand for Hydrogen. Northern Ireland will need to identify a different source of significant demand to incentivise investment in Hydrogen production.
- Trials in Great Britain are proving that the existing gas network can safely accommodate up to 20% Hydrogen (by volume) without any material effect on the gas network or consumer appliances. The NI Gas Network therefore represents an enormous potential source of ready demand for Hydrogen which could help unlock early investment in NI's Hydrogen economy and at the same time reduce domestic and non-domestic CO₂ emissions by up to 200,000 tonnes per annum (based on 2021 demand)¹²



A decarbonised gas network takes advantage of Northern Ireland's very high renewable gas production potential

Northern Ireland has several natural advantages that provides the region with enormous potential to indigenously produce sufficient Biomethane and Hydrogen.

- NI has significant levels of curtailed wind generation – 7.8% of total available wind generation wasn't utilised in 2021 – and without mitigation this figure is expected to grow significantly as the electricity system targets 80% renewable generation by 2030. This ready supply of low-cost, often curtailed, renewable electricity can be harnessed to produce Green Hydrogen.
- Northern Ireland has a comparatively large agriculture sector which, if fully harnessed, could potentially meet up to 82% of the region's 2021 distribution network demand and at the same time improve farm productivity, reduce farm GHG emissions, and help tackle NI's significant manure-based nutrient surplus.¹¹



Why the Gas Networks will play a key role in Northern Ireland's pathway to Net-Zero

NI's gas industry has an existing skilled workforce already in place to support the transition to renewable gas

Unlike other low carbon heating industries that are still in their infancy, the NI gas industry has built up a highly skilled workforce of over 2,500 over the past 25 years.

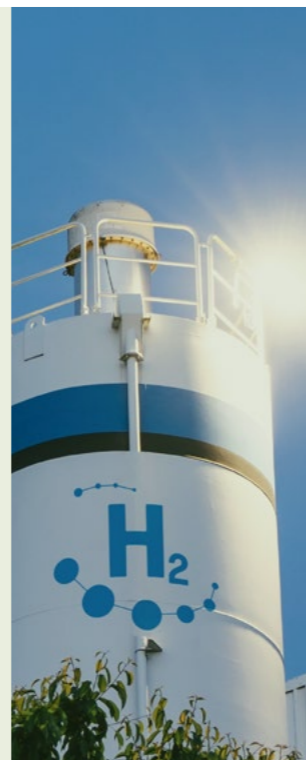
- The NI GNOs have significant experience of building a skills base in the c.25 years since natural gas first became available in Northern Ireland. This expertise is immediately available to support the switch to a decarbonised gas network.
- The Northern Ireland Natural Gas Association was established in 1997 and has been influential in developing the skills base of the local gas industry, tackling issues of quality, marketing skills, supply chain issues, and training across NI. This has resulted in the development of an industry which is trusted by consumers and has the necessary skills to support a decarbonised gas network.



A decarbonised gas network offers capabilities which improve the resilience & efficiency of Northern Ireland's future Net-Zero whole energy system

Unlike electricity, gases such as Hydrogen and Biomethane are suitable for long-duration storage. The ability to store energy for long periods (interseasonally) reduces energy system costs by offering greater flexibility, improving renewable generation efficiency and supporting system resilience.

- Green Hydrogen produced by utilising renewable electricity generated during periods of low demand can be stored and kept for use during periods of high demand – cold weather/periods of low wind generation.
- The availability of storage significantly reduces the infrastructure required to reliably meet future peak energy demand – reducing overall system costs. Northern Ireland has the opportunity to take advantage of the proposed underground gas storage facilities at Islandmagee - which offer significant storage capacity at the perfect strategic location (the gas entry point into NI).



Continuing to utilise NI's £1 billion gas network not only protects consumers' investment to date, but also supports other sectors' transition to Net-Zero – agriculture, residential, industrial, power and transport.

Continuing to utilise NI's £1 billion gas network in Northern Ireland's pathway to Net-Zero represents a balanced approach which protects consumers' investment to date and provides an increasingly diverse, integrated and resilient energy system.

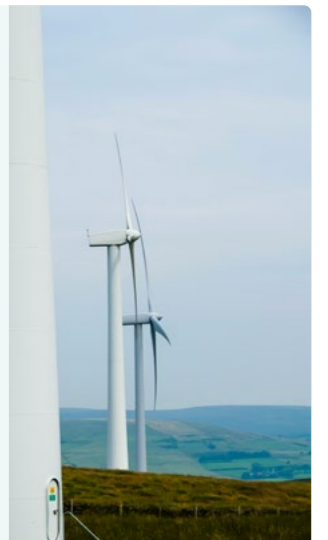
- The NI Network was installed relatively recently, and the vast majority of the distribution network consists of modern plastic pipes suitable for re-purposing to Hydrogen – placing the NI Gas Network ahead of the curve compared to Great Britain's older networks.
- By transitioning the NI Gas Network away from natural gas to indigenously produced renewable gases like Biomethane and Hydrogen we are providing an opportunity for our existing network infrastructure to become a key enabler in Northern Ireland's pathway to Net-Zero – offering a solution to both its traditional partners (the Residential, Industrial, and Power sectors) and less traditional partners like the Transport and Agricultural sectors.



Utilising indigenously produced renewable gases supports economic growth across Northern Ireland

There is a significant opportunity to leverage Northern Ireland's comparatively large agricultural base and excellent wind resources to enable indigenous production of Biomethane and Green Hydrogen – securing investment and jobs across the region.

- Northern Ireland has historically been a gas importer with the jobs associated with gas production all located elsewhere.
- The transition to utilising renewable gases offers the opportunity for Northern Ireland to expand its economy by investing in indigenous renewable gas generation and in turn supporting local production (offering the economic opportunity to export renewable gas knowledge and products).



Renewable Gases: Biomethane

What is it? – Biomethane is a green, non-fossil source of energy, produced from biogas derived from organic waste via Anaerobic Digestion. In terms of its chemical composition, Biomethane is nearly indistinguishable to the composition of the natural gas currently flowing through the NI Gas Network. Sources of Biomethane feedstock include landfill, food waste, livestock waste or underutilised grassland.

Is this a new technology? – No. Biomethane is a proven alternative to natural gas which is already injected into gas networks across Europe. In Denmark for example, 20% of total gas consumption is met by Biomethane and the country aims to increase this share to 100% by 2050¹³

What's the impact on consumers? – As Biomethane is nearly identical to natural gas, blending it into the gas grid offers a means to reduce the carbon footprint of NI's gas supply without asking the consumer to change anything.

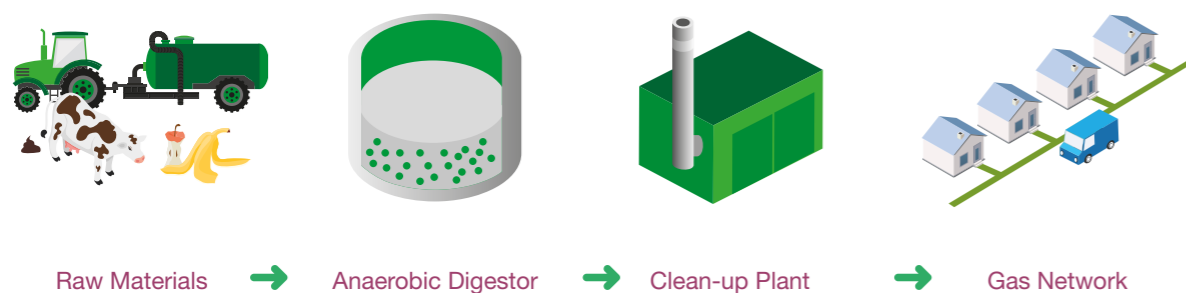
What are the environmental benefits? – Biomethane has several environmental benefits, the main one being that it re-purposes methane from waste which would otherwise be released into the atmosphere. Not only does producing Biomethane provide a green solution for homes, businesses, transport and power generation, it

also reduces farm methane emissions - a significantly more potent greenhouse gas than carbon dioxide - and helps tackle NI's significant manure-based nutrient surplus.

When will Biomethane be available on the gas network? – The NI GNOs have been working with industry partners and the Utility Regulator to put in place the necessary regulatory framework required to facilitate the injection of Biomethane into the gas network. This workstream is expected to be completed by the end of 2022.

How can we unlock the full potential of our Biomethane resource? – Government, regulators, producers, GNOs, industry, farmers and environmentalists urgently need to work together to identify a clear plan for the large-scale production and gas network injection of Biomethane in Northern Ireland at the lowest possible cost. The recent establishment of a cross-departmental working group on Biomethane production by DfE and the Department of Agriculture, Environment and Rural Affairs (DAERA) was a welcome development.

Fig 4. Biomethane production process



How much Biomethane is available?

A collaborative research project - involving Queen's University Belfast, Agri AD, Enerchem, AFBI & Phoenix Natural Gas and supported by the Centre for Advanced Sustainable Energy and Invest NI - has found that Northern Ireland has the resources to produce more Biomethane from agricultural waste and underutilised grassland than previously thought possible – over 600 million cubic metres per annum – the equivalent of 82% of 2021 regional distribution network demand.¹⁴

It is important to note that 83% of the feedstock required to produce this level of Biomethane is located within 10km of the gas network – making the task of producing, and then injecting, this considerable Biomethane resource, much simpler.

Crucially, this estimation is conservative. It doesn't include potential feedstock from dedicated energy crops or domestic and non-domestic waste.



Key Results

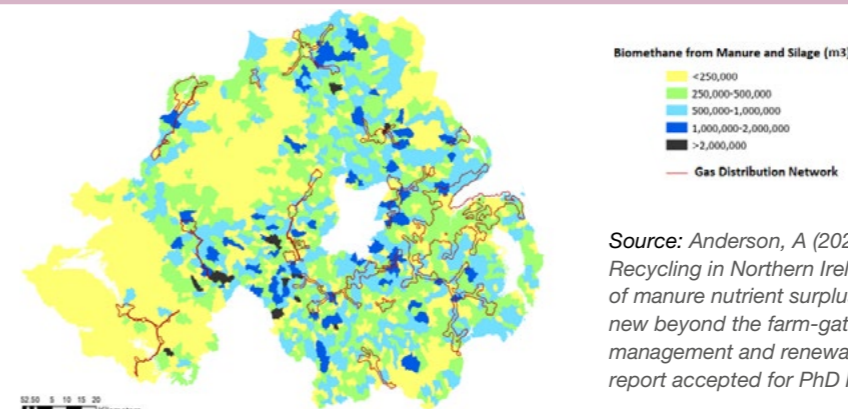
NI's total Biomethane potential from (housed) cattle, pig and poultry manure plus underutilised silage is

6,124 GWh

83% of potential Biomethane feedstock is located within 10km of the NI Gas Distribution Network

6,124 GWh of Biomethane equates to **82%** of 2021 gas distribution network demand

Fig 5. Spatial map of Biomethane availability



Source: Anderson, A (2021). The Sustainability of Organic Nutrient Recycling in Northern Ireland: Mapping the spatial distribution of manure nutrient surpluses at a townland scale, to support new beyond the farm-gate strategies for sustainable manure management and renewable energy production. Differentiation report accepted for PhD Research, Queen's University Belfast

Renewable Gases: Hydrogen

What is it? - Hydrogen is one of the most abundant elements in the universe and produces no CO₂ when consumed as a source of energy. New production techniques combined with the availability of large-scale renewable generation has made Hydrogen a viable low-carbon alternative to natural gas.

Why is Hydrogen often associated with different colours? - The different colours denote the production process used to produce that Hydrogen. For example, Grey Hydrogen is generated via the combustion of fossil fuels and as a result produces carbon. Blue Hydrogen is produced using the same process, but the majority of the carbon produced is captured.

What is Green Hydrogen? - Green Hydrogen is produced through electrolysis, using electric current from renewable electricity generation to separate Hydrogen and Oxygen from water. Unlike in the case of Blue Hydrogen, no carbon is produced, so there is no need to apply carbon capture storage processes.

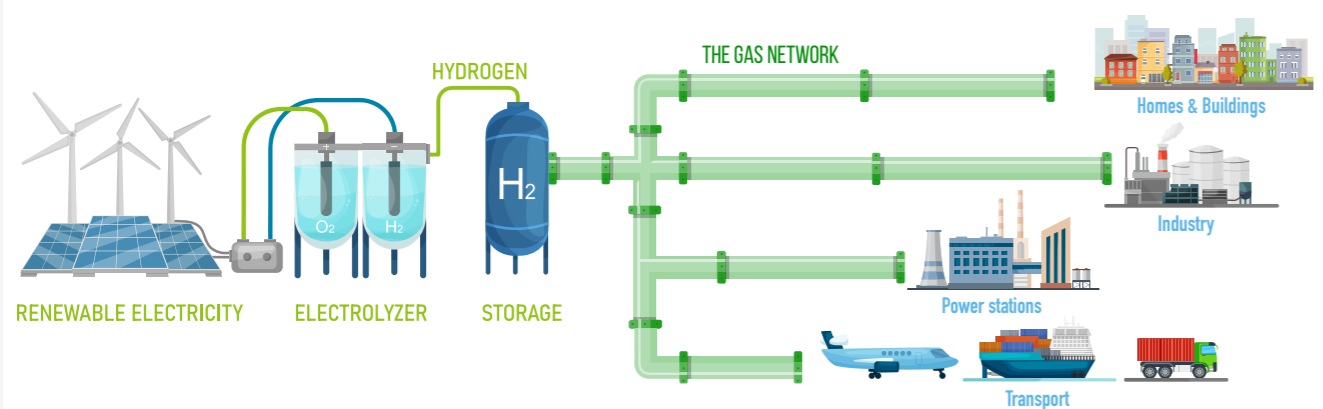
How can Hydrogen heat my home? - Hydrogen-ready boilers work exactly the same as standard gas boilers but are able to switch to using 100% Hydrogen. There is no need to retrofit homes to accommodate new heating systems and the price of a Hydrogen-ready boiler will be similar to current gas boilers.¹⁵

How much is available? - Green Hydrogen production levels are determined by a region's ability to produce the necessary renewable electricity to power electrolyzers and then store the Hydrogen for when it's required. Northern Ireland is well placed to become a significant producer of Green Hydrogen due to its excellent wind resources and the availability of large capacity gas storage at Islandmagee.

How will Hydrogen be phased in? - The NI Energy Strategy states that the necessary regulatory and legislative framework allowing Hydrogen to be injected into the NI Gas Network will be reviewed by 2025. Once it is, and subject to successful trial projects by NI GNOs, Hydrogen can be blended into the existing gas network by up to 20% (by volume) without any impact on the consumer. Once sufficient Hydrogen-Ready boilers are installed, Hydrogen zones within the gas network can be created in which properties are switched over to 100% Hydrogen in a gradual street by street process.

Will switching to 100% Hydrogen be disruptive? - The NI GNOs are capable of managing the conversion process in a phased manner to ensure that consumers enjoy a seamless switch from natural gas to Hydrogen. This is a process that the gas industry has completed before when the gas network in Great Britain switched from town gas to natural gas in the 1960s and 1970s.

Fig 6. Green Hydrogen production process



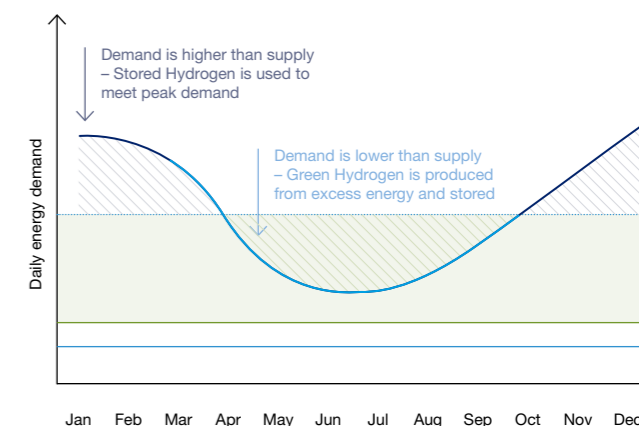
Gas storage facilities play a crucial role in Northern Ireland's pathway to Net-Zero

Northern Ireland is fortunate to have an abundance of renewable electricity generation, but its intermittency presents significant challenges. It's vital that consumers are supported by a resilient energy system which can manage prolonged periods when the wind doesn't blow.

Unlike electricity, renewable gases are suitable for long-duration intra-seasonal storage. This means that Green Hydrogen or Biomethane produced in the summer - when there is reduced demand - can be stored and used in the winter when heat demand reaches its peak.

The availability of large-scale storage also improves the efficiency of renewable gas producers - and in the case of Green Hydrogen the supporting renewable electricity generators - as they can operate at greater capacity all year round. This reduces the cost of Net-Zero for the consumer and mitigates security of supply concerns.

Fig 7. Advantages of storage



Gas Goes Green, A System For All Seasons, October 2021



Renewable Gases: Injecting Hydrogen safely into the Gas Network

In July 2021, the Department of Business, Energy and Industrial Strategy announced the results of the 3.5-year long project, called Hy4Heat, which examined the safety of using Hydrogen inside homes.

After conducting hundreds of tests, Hy4Heat's Safety Assessment suggests that with relatively small changes to the gas pipes used to transport Hydrogen from the gas grid into a home, the use of 100% Hydrogen can be made just as safe as the existing natural gas-based system we use today.¹⁶ In addition, because Hydrogen doesn't include carbon, its use eliminates the possibility of carbon monoxide poisoning.

There are currently several trial projects underway in Great Britain to confirm and expand upon the Hy4Heat research.



HyDeploy - Keele University ●

The first ever live demonstration of Hydrogen in homes took place at Keele University between Autumn 2019 and Spring 2021. The full project report confirmed that consumers with a blended gas supply don't have to change their cooking or heating appliances.¹⁷

HyDeploy - Winlaton ●

Following the success of the Keele Trial, since August 2021 the HyDeploy project blended up to 20% of Hydrogen (by volume) with natural gas on a public gas network in Winlaton, Gateshead – a community with 668 homes, a school and some small businesses.

HyNet

HyNet - North West ●

HyNet North West is a low carbon and Hydrogen energy project based in North West England and North Wales. From 2025, HyNet aims to produce, store and distribute Hydrogen as well as capture and store carbon from industry.¹⁸



Wales and West Utilities - Swindon injection ●

In August 2021, Wales & West Utilities began injecting gas containing up to 1% Hydrogen into its gas network in Swindon. This marked the first time the Health and Safety Executive (HSE) have permitted natural gas with an elevated Hydrogen level to be used in the national network. This project will reduce the carbon emissions of almost 2,500 local homes by up to 5,000 tonnes.¹⁹



SGN Group - H100 Fife ●

SGN Group are developing a world-first Green Hydrogen distribution network in Levenmouth which will heat 300 local homes with 100% Hydrogen produced by a dedicated electrolysis plant, powered by a nearby offshore wind turbine.



HyNTS ●

The HyNTS FutureGrid programme will demonstrate that the National Transmission System (NTS) can safely transport Hydrogen via an offline purpose-built facility at Spadeadam. NTS assets will be tested at different blends of Hydrogen up to 100% and the outcomes will inform the development and design of future projects.



East Coast Hydrogen ●

Focused on developing Hydrogen clusters in Teeside and Humber, East Coast Hydrogen is a collaboration between Northern Gas Networks, Cadent and National Grid Gas Transmission, an ambitious but realistic programme which has the potential to connect over 7GW of Hydrogen production by 2030.

There are also several trial projects underway in Northern Ireland and Ireland:



Ballylumford Power-to-X Project ●

Part of the UK Government's Longer Duration Energy Storage Demonstration innovation competition, the Ballylumford Power-to-X Project on Islandmagee will undertake initial engineering design work to demonstrate the concept of storing Green Hydrogen from renewable energy sources such as wind and solar in underground salt caverns for later use.



Gas Networks Ireland (GNI) Hydrogen Innovation Centre ●

GNI have established a Hydrogen Innovation Centre in West Dublin to confirm that the gas network is capable of safely transporting and storing Hydrogen. The off-network facility at Brownsbarn will allow pipelines, meters and appliances to be tested with a variety of Hydrogen blends.



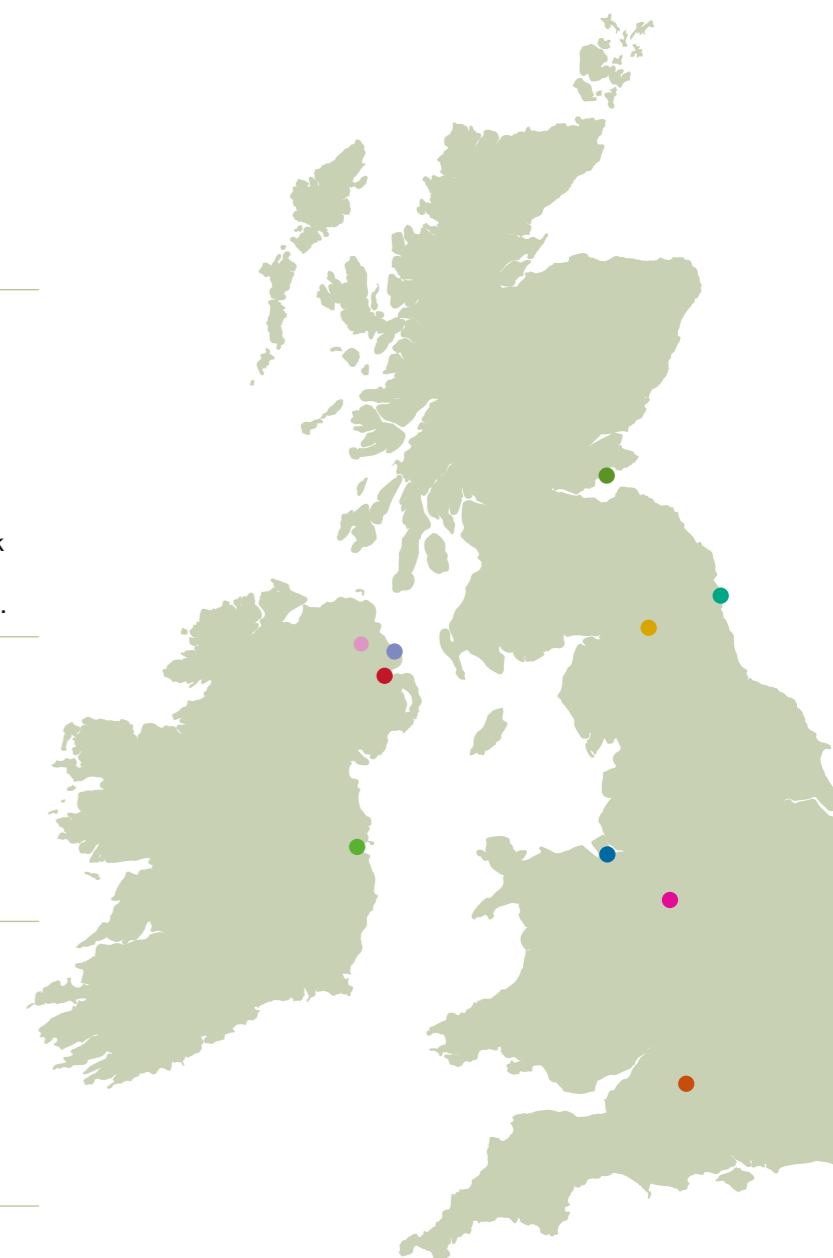
NI Water Duncrue Electrolyser ●

After the recent success of a 10kW pilot electrolyser project, NI Water are installing a 1MWe demonstration electrolyser - the first in Northern Ireland - at their Waste Water Treatment Works at Duncrue Street, Belfast.



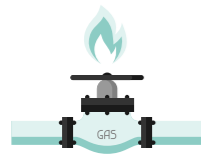
Hydrogen powered buses ●

Translink are utilising renewably-sourced Hydrogen fuel from an on-shore North Antrim windfarm to fuel new sustainable Hydrogen fuel cell electric double-decker buses developed by local manufacturer Wrightbus.

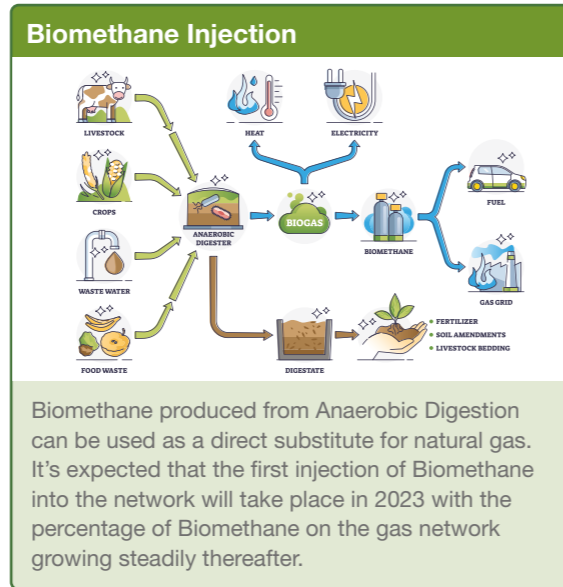


Consumer Journey to Net-Zero gas

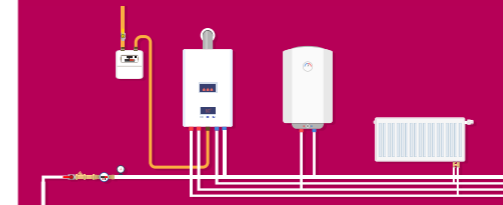
Switching to Natural Gas



Consumers continue to make the switch from oil to immediately reduce their carbon footprint and enjoy the lifestyle and efficiency benefits associated with connecting to natural gas - safe in the knowledge that the network they are connecting to will switch to renewable gases in the future.



Getting Hydrogen-Ready



When installing a new heating appliance – at first connection or end of life – consumers will be advised to install a Hydrogen-Ready boiler/hybrid heat-pump (once they become available) to ensure they are future-proofed should their gas supply switch to 100% Hydrogen.

Switching to 100% Renewable Gases



As the Energy Transition accelerates and more and more renewable gases become available, the NI GNOs will begin switching consumers over to either Biomethane or Hydrogen. Which renewable gas each village, town or region is switched to will be determined by a range of factors that drive the most effective and economic solution.

The switch over process will take place in a phased manner to ensure that consumers enjoy a least-disruptive switch. This is a process that the gas industry has experienced before when the gas network in Great Britain switched from town gas to natural gas in the 1960s and 1970s and, more recently, switching tanked Liquefied Petroleum Gas fuelled homes to natural gas.

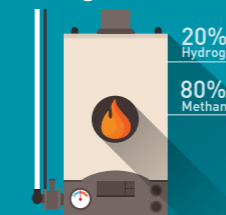
Energy Efficiency



Energy efficiency is central to the consumer journey to Net-Zero as the least expensive unit of energy is the one that's never used.

As is already standard practice, gas industry Energy Advisers will continue to encourage and support consumers by providing information on energy efficiency measures when new gas connections are being installed.

Hydrogen blending



Modern gas boilers and appliances can accommodate a methane/Hydrogen blend of up to 20% Hydrogen. Consumers should anticipate Hydrogen to be first blended into the NI Gas Network from the middle of this decade.

An extensive safety trial at Keele University demonstrated that Hydrogen can be blended into the existing distribution network safely and without any disruption to the consumer.

NI Gas Network Pathway to 2050 Net-Zero

The NI Gas Network Operators have established an overarching Pathway to 2050 Net-Zero to guide our ongoing efforts to decarbonise the NI Gas Network.

At the heart of our pathway is a vision of an affordable, least-disruptive, transition to Net-Zero where our consumers can continue to enjoy all the convenience and benefits of a gas heating system safe in the knowledge that the gas they use will be 100% renewable by 2050.

Our high-level Pathway to Net-Zero (detailed over the following pages) consists of six distinct stages. At each stage, the pathway sets out – at a high level – the expected key developments, the necessary infrastructure requirements and the supporting actions required for the Pathway to succeed.

We are already well underway with progressing the first two stages - Preparing for the Transition (2022–2025) and First Renewable Gas Connections (2022–2026) - and this is especially true with regard to Biomethane. The Biomethane regulatory framework is expected to be in place by the end of 2022 and we expect to begin injecting Biomethane into the network shortly after.

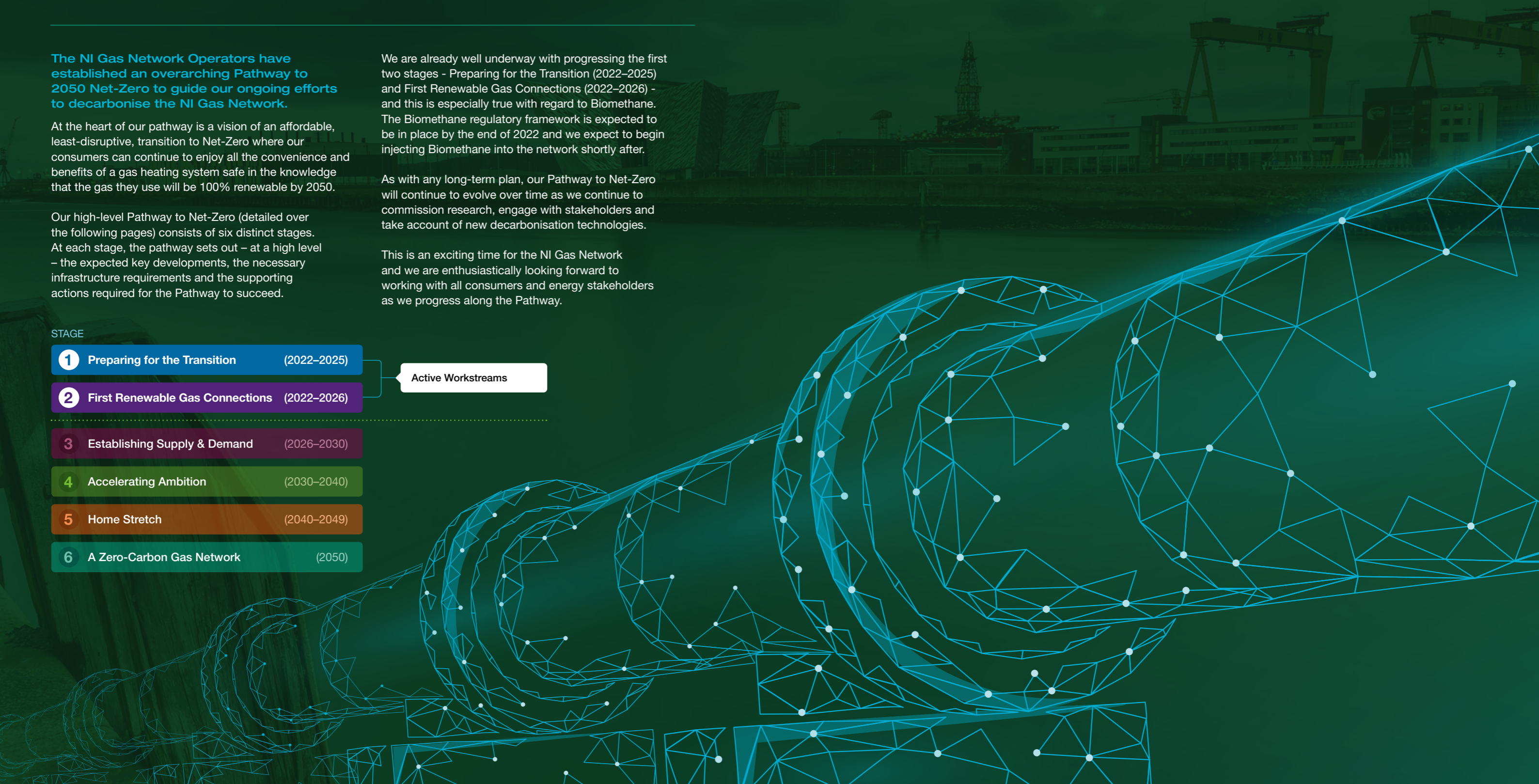
As with any long-term plan, our Pathway to Net-Zero will continue to evolve over time as we continue to commission research, engage with stakeholders and take account of new decarbonisation technologies.

This is an exciting time for the NI Gas Network and we are enthusiastically looking forward to working with all consumers and energy stakeholders as we progress along the Pathway.

STAGE

- 1 Preparing for the Transition (2022–2025)
- 2 First Renewable Gas Connections (2022–2026)
- 3 Establishing Supply & Demand (2026–2030)
- 4 Accelerating Ambition (2030–2040)
- 5 Home Stretch (2040–2049)
- 6 A Zero-Carbon Gas Network (2050)

Active Workstreams



STAGE

1

Preparing for the Transition (2022-2025)

STATUS

● Underway

OVERVIEW

This initial phase of the Pathway is primarily focused on strategic planning, with an emphasis on the technical, policy, legislative and regulatory preparation required to facilitate the decarbonisation of the energy system and the scale up of renewables gases in NI

KEY DEVELOPMENTS

- Regulatory frameworks established to facilitate the injection of Biomethane and Hydrogen into the gas network
- The NI GNOs scale up research into Hydrogen and Biomethane production potential and conduct technical studies of how and where indigenous renewable gas production can be best connected to the gas network
- NI GNOs work in partnership with other utilities to support a 'whole-system' approach to gas network decarbonisation planning

KEY SUPPORTING ACTIONS

- Energy policy and regulatory frameworks are adapted to support the strategic priorities set out in the 2021 NI Energy Strategy and 2022 NI Climate Change Act
- Enact new energy legislation to provide the Utility Regulator with the appropriate mandate to support a Net-Zero carbon future
- Develop targeted financial support and regulatory mechanisms to support GNO decarbonisation research and Biomethane and Hydrogen demonstration workstreams
- New gas boiler and appliance installations (plus energy efficiency systems such as Hybrid Heat Pumps) are legislatively mandated to be Hydrogen-Ready from at least 2026
- Engagement with key stakeholders in both Great Britain and Ireland to maximise potential synergies and learn from best practice
- Targeted consumer stakeholder engagement to create awareness of the gas network's pathway to Net-Zero and better understand their needs
- Evaluation of future renewable gas storage requirements

STAGE

2

First Renewable Gas Connections (2022-2026)

STATUS

● Underway

OVERVIEW

This phase is primarily focused on establishing Biomethane and Hydrogen production to facilitate the injection of renewable gas into the NI Gas Network. Initial Hydrogen production levels are kept low to limit consumer impact while trials are ongoing

KEY DEVELOPMENTS

- First injections of Biomethane and Hydrogen into gas network
- Establishment of specific trial projects to build momentum, stimulate demand, test delivery and commercial models and inform type/level of support required to deliver Net-Zero gas
- The switch of on-gas-grid oil users to natural gas accelerates with c.380k properties connected to grid by 2026
- One-stop-shop with improved Energy Efficiency schemes is launched. GNOs work closely with the new organisation to encourage fuel switching and maximise carbon reductions
- Establishment of first Bio-CNG infrastructure to support Transport Sector's transition to renewable gas powered vehicles

KEY SUPPORTING ACTIONS

- Standardisation of gas network connection requirements
- Structured collaboration with electricity, transport, waste, industry and agriculture sectors to identify which initial renewable gas production projects provide the greatest multi-sectoral benefits
- A programme of Biomethane and Hydrogen demonstration projects is agreed between Executive, regulatory authorities and industry to attract investment in renewable gas production and expand regional gas industry skills and knowledge
- GNOs continue to monitor activity in Great Britain and Ireland to ensure the necessary preparatory activity takes place to ensure the NI Gas Network remains compatible with network developments in interconnected jurisdictions
- GNOs conduct a technical study to assess what potential network changes are required to facilitate a transition to Net-Zero

STAGE

3

Establishing Supply and Demand
(2026–2030)

STATUS

● In preparation

OVERVIEW

This phase sees the first Hydrogen and Biomethane demand clusters emerge as production levels steadily climb encouraged by ambitious Executive production targets. Improved Hydrogen and Biomethane availability allows early adopters in the transport, industry, and power generation sectors to begin their transition to renewable gases

KEY DEVELOPMENTS

- By 2030, 15% of NI Gas Network consumption (by energy) is met by renewable gases
- The NI Gas Network can accept up to 20% Hydrogen blend (by volume)
- Roll-out of Hydrogen-ready gas boilers and appliances facilitates accelerated switch of on-grid oil users to natural gas. Circa 430k properties connected to gas grid by 2030

INFRASTRUCTURE INVESTMENT

- No significant change to Gas Network infrastructure required by 2030 as Hydrogen volumes remain below 20%
- First Biomethane and Hydrogen storage projects are established

KEY SUPPORTING ACTIONS

- Rollout of targeted support mechanisms for Hydrogen and Biomethane production to facilitate ambitious 2030 NI Executive production targets
- Gas industry continues to work closely with proposed one-stop-shop organisation to support installation of energy efficiency measures during gas network connection
- Continued structured engagement with electricity, transport, industry and agriculture sectors to identify potential multi-sectoral benefits from collaboration
- Development of skills and labour capacity to support expansion of indigenous renewable gas production
- GNOs develop future gas network strategy to manage interconnection with GB/Rol, transportation, and distribution of Biomethane and Hydrogen
- GNOs collaborate with the power sector to trial fuelling gas-fired power generator fleet with renewable gas blends

STAGE

4

Accelerating Ambition
(2030–2040)

STATUS

● In preparation

OVERVIEW

This phase focuses on building upon the foundations of the previous decade to facilitate a significant expansion of Biomethane and Hydrogen production. The expansion of renewable gas production supports significant strides in the decarbonisation of industry, transport and power generation

KEY DEVELOPMENTS

- By 2040, 75% of NI Gas Network consumption is met by renewable gases
- First 100% Hydrogen zones are established in NI
- Regionalisation of gas supply and the development of distinct Hydrogen and Biomethane zones in NI

INFRASTRUCTURE INVESTMENT

- The development of 100% Hydrogen zones will require the coordinated conversion of sections of the transmission and distribution network. This requires a coordinated series of network upgrades and repurposing, and could require end-users to change their processes and equipment. Long-term planning reduces costs
- Decarbonisation of conventional (thermal) electricity generation may require adjustments to gas transmission network management and/or station equipment
- Significant Biomethane and Hydrogen storage is commissioned to unlock NI Gas Network's ability to efficiently absorb renewable gas production and securely meet extreme peaks in demand

KEY SUPPORTING ACTIONS

- NI Executive sets ambitious 2040 Hydrogen and Biomethane production targets supported by financial incentives
- GNOs continue to tailor future gas network strategy to account for emerging renewable gas production trends, network management considerations etc.
- Identify appropriate cost-sharing methodologies based on existing regulatory approaches to manage potential differences in cost of renewable gases

STAGE

5

Home Stretch (2040-2049)

STATUS

In preparation

OVERVIEW

With Hydrogen-ready boilers widely installed in NI homes by this time, this phase focuses on switching users not already benefiting from Biomethane to a 100% Hydrogen supply. Increasing demand spurs further investment in renewable gas production

KEY DEVELOPMENTS

- GNOs manage the roll-out of a finalised network splitting strategy. Steady expansion of 100% Hydrogen zones is supported by a planned programme of continued network upgrades
- Biomethane hits peak production, servicing large areas of NI with renewable gas
- Expansion of Green Hydrogen production facilitated by continued expansion of renewable electricity generation
- Economics, Executive policy, and availability of supply determine whether Northern Ireland becomes a net importer or exporter of Hydrogen via repurposed gas interconnection
- The programme of energy efficiency measures is completed

STAGE

6

A Zero-Carbon Gas Network (2050)

STATUS

In preparation

OVERVIEW

By 2050, natural gas is entirely replaced by Hydrogen and Biomethane offering zero-carbon fuel solutions to residences, services, power, industry and transport sectors

KEY DEVELOPMENTS

- By 2050, the number of properties using renewable gas is expected to have reached 505k - equivalent to c.57% of all properties in Northern Ireland and c.90% of those properties that can connect to the network
- The NI Gas Network conveys 100% renewable gas - the exact final split between Hydrogen and Biomethane is determined by what's most economic for consumers
- Repurposed gas interconnectors offer the opportunity for Northern Ireland to export indigenously produced Hydrogen to GB/ROI/European markets during times of surplus and at the same time supports security of supply by facilitating imports

Sources/ Acknowledgements

- 1 Derived from comparing connections and consumption data from 2021 Utility Regulator Quarterly Transparency reports with GMO NI 2021 DPO Quarterly Exit Volumes and Capacity Reports
- 2 Sir Peter Kendall, Independent Strategic Review of the Northern Ireland Agri-Food Sector, January 2022
- 3 KPMG/Action Renewables, Supporting a renewable gas sector in Northern Ireland, September 2022
- 4 Derived from analysis of 2021 GMO NI DPO Quarterly Exit Volumes and Capacity Reports
- 5 Derived from applying UK Government GHG Conversion Factors for Company Reporting to 2021 NI Gas Distribution Network Demand.
- 6 Phoenix Natural Gas Limited, Responsible Business Report 2020, pg.11
- 7 Ibid
- 8 Frontier Economics, Hydrogen Options for Northern Ireland, June 2021
- 9 KPMG/Action Renewables, Supporting a renewable gas sector in Northern Ireland, September 2022
- 10 H&V News, Four manufacturers make 'Hydrogen-ready' boilers cost pact, 29th July 2021
- 11 N Meta, A Anderson, C Johnston, D Rooney, Evaluating the opportunity for utilising anaerobic digestion and pyrolysis of livestock manure and grass silage to decarbonise gas infrastructure: A Northern Ireland case study, July 2022
- 12 Derived from applying UK Government GHG Conversion Factors for Company Reporting to 2021 NI Gas Distribution Network Demand.
- 13 Energinet, NEW RECORD FOR BIOGAS IN THE GAS SYSTEM IN 2021, 10th January, 2022
- 14 N Meta, A Anderson, C Johnston, D Rooney, Evaluating the opportunity for utilising anaerobic digestion and pyrolysis of livestock manure and grass silage to decarbonise gas infrastructure: A Northern Ireland case study, July 2022
- 15 H&V News, Four manufacturers make 'Hydrogen-ready' boilers cost pact, 29th July 2021
- 16 Hy4Heat, WORK PACKAGE 7, Safety Assessment: Conclusions Report, May 2021
- 17 HyDeploy, Demonstrating non-disruptive carbon savings through Hydrogen blending, August 2021
- 18 HyNet North West, Unlocking Net-Zero for the UK, p.18
- 19 Wales & West Utilities, Wales & West Utilities gets go-ahead to inject Hydrogen to grid in Swindon, 26th August 2021

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