



An Energy Consensus - Developing a Regional Integrated Energy System

In partnership with



Northern Ireland
Gas Network Operators



Table of Contents

1

**Introduction &
forewords**

04

2

**Executive
summary**

08

3

**A shared
vision**

10



1. Introduction

Northern Ireland stands at a pivotal moment in its energy transition. The legislative commitment to achieve net zero by 2050, which includes ambitious 2030 decarbonisation targets, requires urgent action across all sectors of the economy. This includes transforming how we generate electricity, how we heat our homes and buildings, how we power industry, and how we transport people and goods.

While different system operators have traditionally presented their own individual pathways to net-zero, this report takes a different approach. It sets out the shared positions and principles accepted by both the electricity and gas sectors, with the aim of strengthening the energy transition through collaboration, not competition.

NI Gas Network Operators; Phoenix Energy, Kinecx Energy, Evolve, Mutual Energy and GNI (UK) have commissioned KPMG to produce this report.



The following chart offers a forward-looking view of Northern Ireland's potential energy demand scenarios, drawing on multiple sources to present a balanced view of how NI's decarbonised energy system may look in 2050. While no projection can claim absolute accuracy, the outlook provided uses data from the NI Energy Strategy and from SONI's Tomorrow's Energy Scenarios alongside KPMG analysis to provide a useful framework for considering the scale of challenge and need for integration. In this context, molecules refer to the physical units of gas, such as methane, biomethane, and hydrogen that flow through the gas network and are consumed for energy.

NI final energy projected demand (TWh)

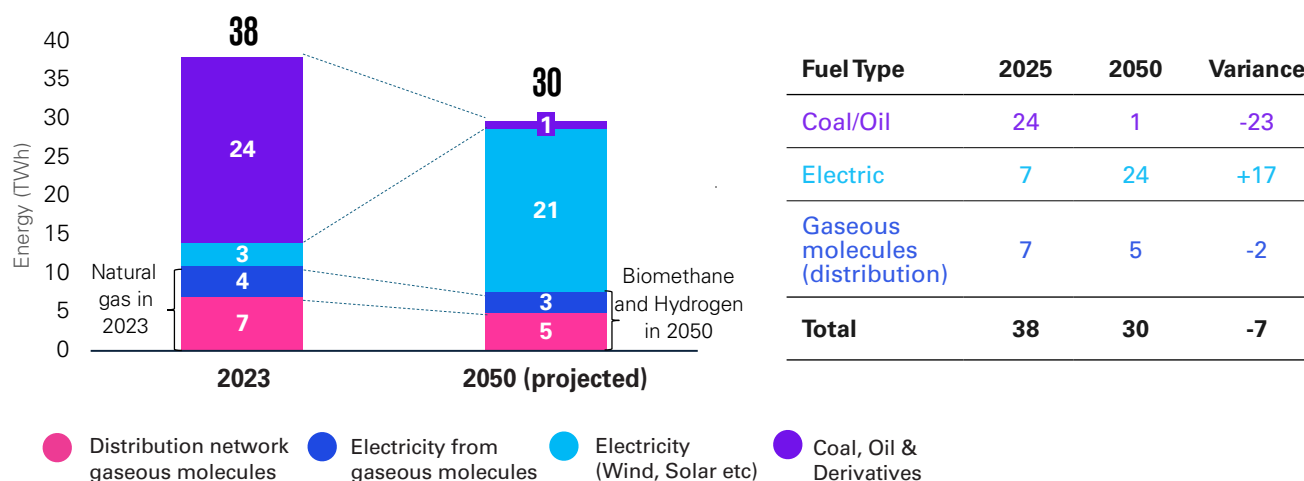


Figure 1 - Energy demand by source in NI 2023 and 2050 projected^{1,2,3}

It is clear from this analysis and other reputable emerging analysis that both gas and electricity networks are needed and will play complementary roles in meeting our future energy system needs. The precise balance between the two may shift over time, renewable gas may be required to do a bit more or a bit less depending on how electricity manages to serve the new loads.

What is certain is that both energy vectors will be critical components of the Future NI energy system. As such, it is prudent to begin shaping a strategy to deliver proportionate investment in advancing both pathways.

This report sets out a shared foundation, a "common ground" of evidence-based, pragmatic positions that reflect the unique realities of Northern Ireland's energy landscape. It considers our infrastructure, geography, natural resources, and economic profile to propose a balanced approach to decarbonisation. Rather than revisiting the traditional divide between gas and electricity, the report focuses on areas of alignment and mutual opportunity.

It emphasises that a resilient, practical, and cost-effective energy transition will require a coordinated deployment of all viable solutions, each serving different roles within the wider system.

Key benefits of this integrated approach include:

- Enhanced energy resilience through diversified low-carbon sources
- Support for indigenous energy production, reducing dependency on imports
- Attraction of low-carbon industries, boosting regional competitiveness
- Stimulation of economic growth while meeting climate targets

Access to low-carbon energy is not just an environmental imperative, it is also a strategic economic enabler. This dual benefit strengthens the case for a forward-looking energy strategy that delivers both climate and economic dividends.

The principles outlined here are not exhaustive. Instead, they are intended as a starting point for further cross-sectoral policy development, investment planning, and public engagement. Achieving net zero will require collaboration across all sectors, grounded in the shared understanding that no single solution can succeed in isolation.

¹ Energy strategy for Northern Ireland, 2050 figures used are scenario averages

² Electricity figures in 2050 are scenario averages across SONI Tomorrow's Energy Scenarios (TES)

³ UK Government: Final Energy consumption at sub national level

Foreword



Kailash Chada

Group Chief Executive
Officer and Phoenix
Energy

1.1 Phoenix Energy

With a focus on delivering renewable gas to Northern Ireland, we see the recommendations in this report as pivotal to unlocking the region's path to net zero. It reflects the existing collaborative engagement between the electricity and gas sectors and will provide the basis from which future integrated enabling market and policy frameworks can be established.

Critically the report recognises that whilst considerable development of the renewable electricity sector will be central to the delivery of the 2022 Climate Change Act targets, optimising the utilisation of the existing gas infrastructure to distribute renewable gas solutions such as biomethane and hydrogen will be an essential component of a resilient, affordable integrated energy system that serves energy users future needs.

Northern Ireland has the infrastructure, resources and expertise to scale renewable gas production quickly. By working together, we can make the best use of existing assets and deliver **a secure, affordable and resilient path to net zero.**

This report sets out a pragmatic and united vision, one we are ready to help deliver.



Derek Hynes

Managing Director
of NIE Networks

1.2 NIE Networks

NIE Networks' strategy to Deliver a Sustainable Energy System for all recognises that all parts of the energy system will have to work in partnership so that as a sector, the energy family does its fair share to deliver the cleanest and most prosperous future possible for everyone in Northern Ireland. This paper sets out some of the areas of strength that the sector is committed to building on over the coming years.

We believe that the electricity network investment planned in RP7 (Regulatory Period 7) and beyond, will play a part in making sure that Northern Ireland has an electricity network with enough capacity, is reliable enough and can be connected to easily so that all our homes and businesses can choose the best means to meet their energy needs.

The energy sector believes that we can attract investment to Northern Ireland. We want to make sure that we make it easy to connect to our networks so that large energy users can efficiently and confidently invest in Northern Ireland. We want to make the most of the decades of investment in our networks and release capacity where possible so that we can generate and consume renewable energy.

We want to build on our existing relationships across the sector and maximise the regulatory frameworks that have served the people of Northern Ireland well over many years. We hope that we can reach across our borders and seas to work with our partners in the EU and across the UK.

**Alan Campbell**

Chief Executive
of SONI

1.3 SONI

We welcome this publication, which reflects a shared commitment to delivering a decarbonised, reliable and affordable energy system for Northern Ireland.

As the Electricity Transmission System Operator for Northern Ireland, we are responsible for enabling the connection and delivery of low-carbon power to homes and businesses. We see first-hand the pivotal role that renewable electricity, particularly from wind and solar generation, will play in the energy transition. We also recognise the important role that the gas system continues to bring in addressing challenges such as security of supply and intermittency as well as the opportunity to decarbonise the gas network itself through the growth in e-fuels such as biomethane.

This report demonstrates that collaboration between energy vectors is essential. By working together and aligning the strengths of electricity and gas infrastructure, we can build a clean, resilient, flexible and future-ready energy system that serves the needs of all consumers in Northern Ireland.

**Paddy Larkin**

CEO of Mutual Energy

1.4 Mutual Energy

Mutual Energy operates across both the electricity and gas sectors and we see strong potential for both to play vital and complementary roles in decarbonising our society.

In NI we have a great opportunity to scale up our production of renewable electricity and where we can produce, distribute and store this renewable power in a cost-effective manner, renewable electricity will drive efficient outcomes.

However, our renewable electricity ambitions must be pursued alongside the development of renewable gas solutions. For example, the development of a biomethane economy in NI would improve the prospects for local agriculture, offer a cost-effective way to start addressing high nutrient levels in our environment and provide a renewable, storable, and dispatchable energy source that can support energy volumes that are not practical or affordable to electrify.

By working together across sectors, we can reduce costs, accelerate the energy transition, minimise disruption for consumers, and maximise the economic opportunities available.

2. Executive summary

Northern Ireland is entering a critical decade for energy transition. As we work to meet ambitious targets under the Energy Strategy and Climate Change Act, it is vital that the decarbonisation of power, heat and transport is pursued through coordinated, evidence-based action.



This joint publication, endorsed by representatives from a range of energy-related industries including electricity, renewable gas, and others, sets out five guiding principles that represent the “common ground” shared across the sector. While each industry may pursue distinct pathways and policy enablers, all are united in their commitment to delivering a secure, affordable, and decarbonised energy system for Northern Ireland.

Our shared principles to deliver a resilient and affordable decarbonisation journey are:



- 1. A diversified energy mix** is essential to providing security of supply, resilience, and protection against price shocks.



- 2. Renewable electricity** as a primary decarbonisation enabler supported by dispatchable, thermal electricity generation.



- 3.** Given the significant investment required to reach net zero, we need to best **utilise existing regional infrastructure**.



- 4.** Hard to electrify end uses, including high temperature industrial thermal solutions, as well as certain housing stock, can be **more economically decarbonised** using renewable gas than deep retrofit and electrification.



- 5. Northern Ireland has the natural resources** to facilitate the production of both biomethane and green hydrogen on a meaningful scale.

Together, these principles form the basis of a collaborative, whole-system approach. They reflect the practical realities of Northern Ireland’s carbon inventory, where emissions from heat, transport and agriculture remain persistently high, and where decarbonisation will require significant progress across all sectors, not just the electricity sector. These shared positions align with the pathways set out in the Energy Strategy and the legally binding targets in the Climate Change Act, offering a practical foundation for action.

By focusing on shared priorities and making best use of the tools already at their disposal, stakeholders can move beyond siloed strategies and accelerate progress towards an optimal whole system net zero pathway in Northern Ireland in a way that is technically feasible, economically efficient, and socially deliverable.

We now turn to each of the five shared principles in more detail, outlining their practical implications and opportunities for coordinated action.

3. A shared vision

3.1 A diversified energy mix is essential to providing security of supply, resilience, and protection against price shocks.

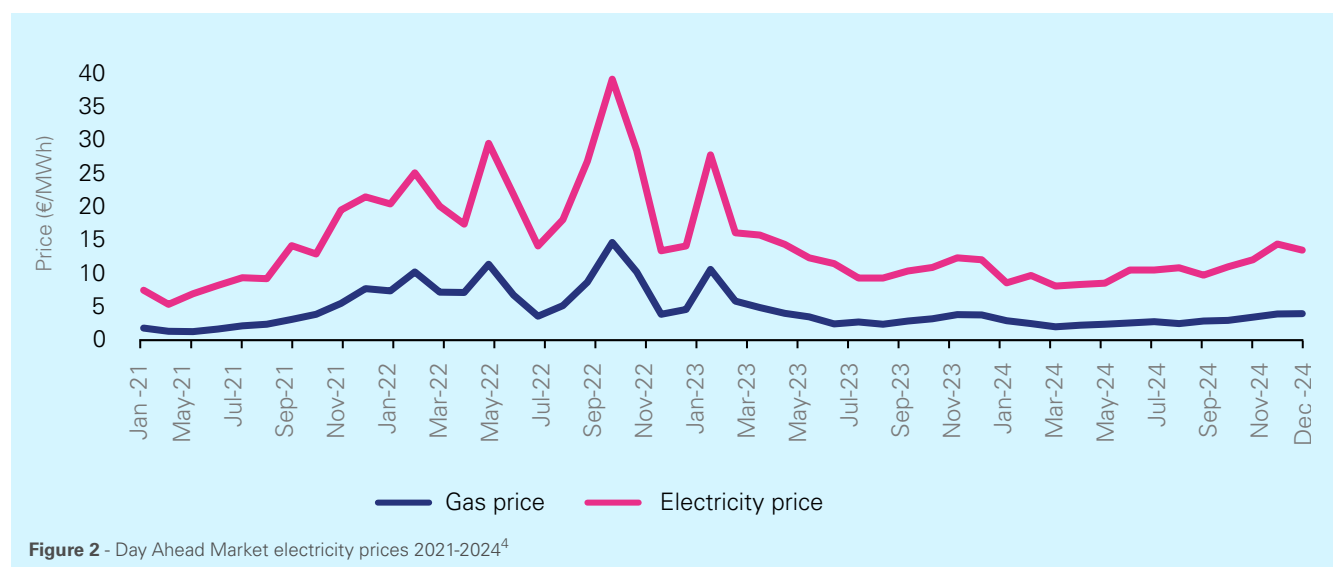
Resilience must be built into the system. This means embracing diversity, not just in technology, but also in fuel supply, infrastructure, and investment strategies. A diversified energy mix is not a compromise; it is a strategic necessity that guards against over-reliance on any single pathway. Crucially, it also unlocks indigenous opportunities, allowing regions to harness local resources, skills, and supply chains to strengthen energy security and economic development.



Recent experience underscores this point. The post-pandemic rebound in energy demand, followed by the 2021-2022 global gas crisis, drove extreme electricity price volatility across Europe. Markets and customers that had come to rely heavily on a single fuel or import route were particularly exposed. Similarly, weather extremes, including prolonged periods of low wind or sudden cold snaps have tested the limits of electricity-only consumers across the UK and Ireland. These events do not follow predictable cycles and cannot be forecast years in advance with confidence.

While scenario planning and long-term modelling remain useful tools, it is important to recognise that all forecasts, whether from the IEA, DESNZ, DfE or the National Grid ESO, are inherently uncertain. Over-committing to a single pathway risks locking in system fragility. By contrast, diversification acts as a hedge, offering the ability to adapt, substitute, or rebalance the system in response to future shocks.

NI gas and electricity prices 2021-2024



A broad energy mix is vital for technical and economic resilience. Historically, natural gas set electricity market prices due to its availability (see Figure 2). As wind and solar generation grow, pricing is shifting, with high output now leading to zero or negative prices. This change highlights the need for market frameworks that reward flexibility and support thermal generation to maintain grid stability during low renewable periods. In future, gas and renewable electricity may be decoupled, allowing a system powered by indigenous sources such as renewable electricity and gases. This could also help Northern Ireland reduce exposure to global energy market prices and improve energy security.

Although gas's pricing role may decline, thermal generation will remain crucial for responding to demand fluctuations. A diverse energy mix is vital: synchronous generators provide inertia, renewables aid decarbonisation, molecules allow for long-term storage, and interconnectors enhance geographic resilience. This diversity bolsters energy security, mitigates global fuel price volatility, and encourages broader investment, ultimately lowering costs.

In pursuing a net-zero future, a diversified energy mix also acts as a catalyst for economic development. Access to renewable electricity and gases attracts energy-intensive industries, promoting the growth of sectors such as data centers and manufacturing. By integrating these diverse sources, Northern Ireland can become an appealing hub for businesses seeking sustainable and reliable energy solutions.

Summary

There is no single technology that will deliver Northern Ireland's net zero future. Over-optimising for one solution increases systemic risk and reduces adaptability. A diversified energy mix, built on the strategic use of both electrons and gas molecules, offers the most resilient, cost-effective, and secure path through an uncertain energy transition.



3.2 Renewable electricity as a primary decarbonisation enabler, supported by dispatchable, thermal electricity generation.

Northern Ireland's path to net zero is predicated on its exceptional renewable electricity potential. With abundant wind resources, a strong track record of delivering renewable generation, and falling technology costs, the region aims to achieve a legally binding commitment to 80 percent electricity from renewable sources by 2030. At present, wind generation alone supplies over 40 percent of electricity demand, evidencing both resource strength and successful policy alignment. However, this shift to increased levels of intermittent renewable generation presents operational and economic challenges. In 2024, over 900 GWh of wind and solar generation was curtailed due to grid constraints, enough to power approximately 50,000 homes for a year.

This significant missed opportunity highlights the need for reducing emissions and improving system efficiency. Enhancing the alignment between electricity demand and renewable availability, especially through flexible consumption, power to X investments, and the electrification of transport, heating, and industrial processes can help absorb excess generation, minimize curtailment, and advance both affordability and climate objectives. Extended periods of low wind and solar output, known as Dunkelflaute events, have seen renewable generation fall substantially for weeks on end, exposing the limits of an electricity-only system.

Histogram showing % of NI Energy demand available from wind and solar in 2024

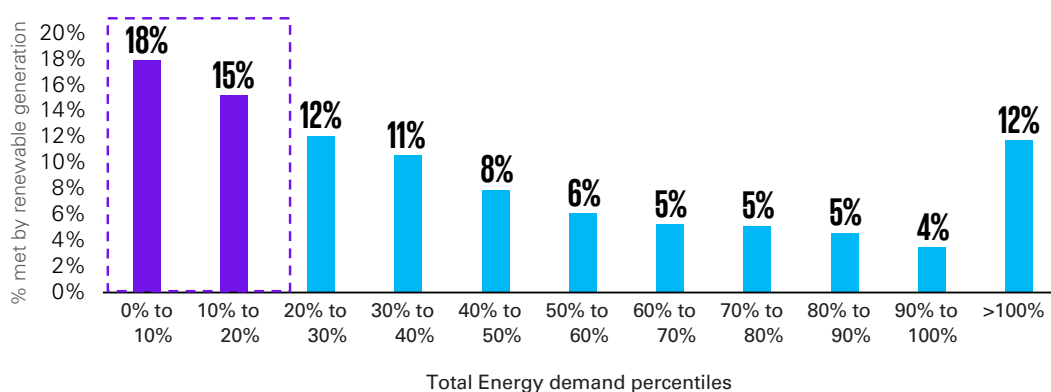


Figure 3 - Illustrates that in Northern Ireland in 2024, wind and solar met an average of 43.5% of total electricity demand. However, for nearly one-third of the year, they failed to supply even 20% of demand. During these periods, flexible gas-fired generation plays a critical role in maintaining system reliability.⁵

Short-duration battery energy storage systems (BESS) provide essential frequency control and intraday balancing, but with just 140 MWh installed, most assets can only discharge energy for only one to two hours at a time. Demand-side response remains limited, with only 63 MW secured in the most recent T-4 capacity auction. Longer-duration energy storage pilots such as flow batteries, compressed air storage and power-to-gas demonstrate promise but are unlikely to reach commercial maturity until the 2030s at the earliest and even then, will be limited in the contribution they can make.

Dispatchable thermal electricity generation therefore remains indispensable. Modern gas-fired powerplants can ramp rapidly, sustain output during renewable shortfalls and deliver critical system services (such as synchronous inertia, voltage control, fault-current support and black-start capability) needed by the grid and which inverter-based renewable generators and batteries cannot easily nor cost effectively replicate. Currently fuelled by natural gas, high-efficiency gas turbines emit far less CO₂ than coal or oil units, making them key transitional assets. **In future, these turbines can run on renewable gases like biomethane and green hydrogen, supporting full decarbonisation of the grid.**

In the National Energy Demand Strategy⁶, the Irish Government notes that “peak day demand is predicted to grow as natural gas will play a greater role in electricity during the transition to a renewables-led system particularly to support the grid in times of low renewable output.”⁷

The Irish Government also recognises the strategic role of natural gas and its importance for energy security and has announced plans to develop a temporary “Strategic Gas Emergency Reserve” in Ireland.

To deliver a secure, affordable and resilient decarbonisation journey, Northern Ireland needs a balanced, whole-system mix:

Short term

Natural gas for storable, dispatchable energy using existing pipelines and infrastructure.

Existing and new gas and electrical interconnectors to neighbouring markets, where economically viable.

Battery energy storage for intraday balancing and grid support.

Long term

Long-duration energy storage systems (Pumped hydro, power-to-gas derivatives, etc) capable of multi-day and seasonal discharge.

Retrofitted thermal assets to run on renewable gases, providing the system services not available from inverter-based technologies and leveraging sunk investment.

⁶ National Energy Demand Strategy

⁷ Gov.ie





Summary

Renewable electricity will lead Northern Ireland's decarbonisation pathway, with green gas molecules providing substantial support to future system needs. A resilient, affordable, and secure energy future is dependent on integrating complementary technologies that fill the gaps left by intermittency and technical feasibility. Renewable gas, large-scale energy storage, and flexible thermal generation are not alternatives to electrification, rather they are its enablers.

3.3 Given the significant investment required to reach net zero, we need to best utilise regional assets as part of the solution.

Maximising the value of existing infrastructure is not simply a cost-saving measure, it is a strategic necessity. Repurposing and enhancing the networks and assets already in place can accelerate the transition, reduce risk, and avoid unnecessary duplication of capital investment.

In July 2025, the Irish Government approved the Renewable Heat Obligation, mandating suppliers to source an escalating share of their heat from renewables and embedding special incentives to catalyse the development of anaerobic digestion plants and the injection of domestically produced biomethane into the Irish national gas network.⁹

The gas network: modern, high capacity, and future-ready

Over £1 billion has been successfully invested in Northern Ireland's gas transmission and distribution network, which now extends over 6,200 km and serves approximately 67% of households. The network is

constructed to modern standards using polyethylene pipes and the system is inherently compatible with biomethane and hydrogen blends. Crucially, it remains underutilised relative to its design capacity due to built-in redundancies and allowances for expansion, offering substantial headroom to integrate renewable gases and expand with minimal additional infrastructure.

Continued utilisation of the modern gas network not only safeguards past investment by consumers in Northern Ireland but also enables the efficient delivery of low-carbon energy with less disruption to communities across the region. Moreover, by making full use of the existing gas infrastructure, and avoiding unnecessary electricity network build out and reinforcement, Northern Ireland can reduce the need for costly and potentially intrusive upgrades to the electricity grid, avoiding unnecessary duplication and accelerating the transition in a more balanced and cost-effective way.

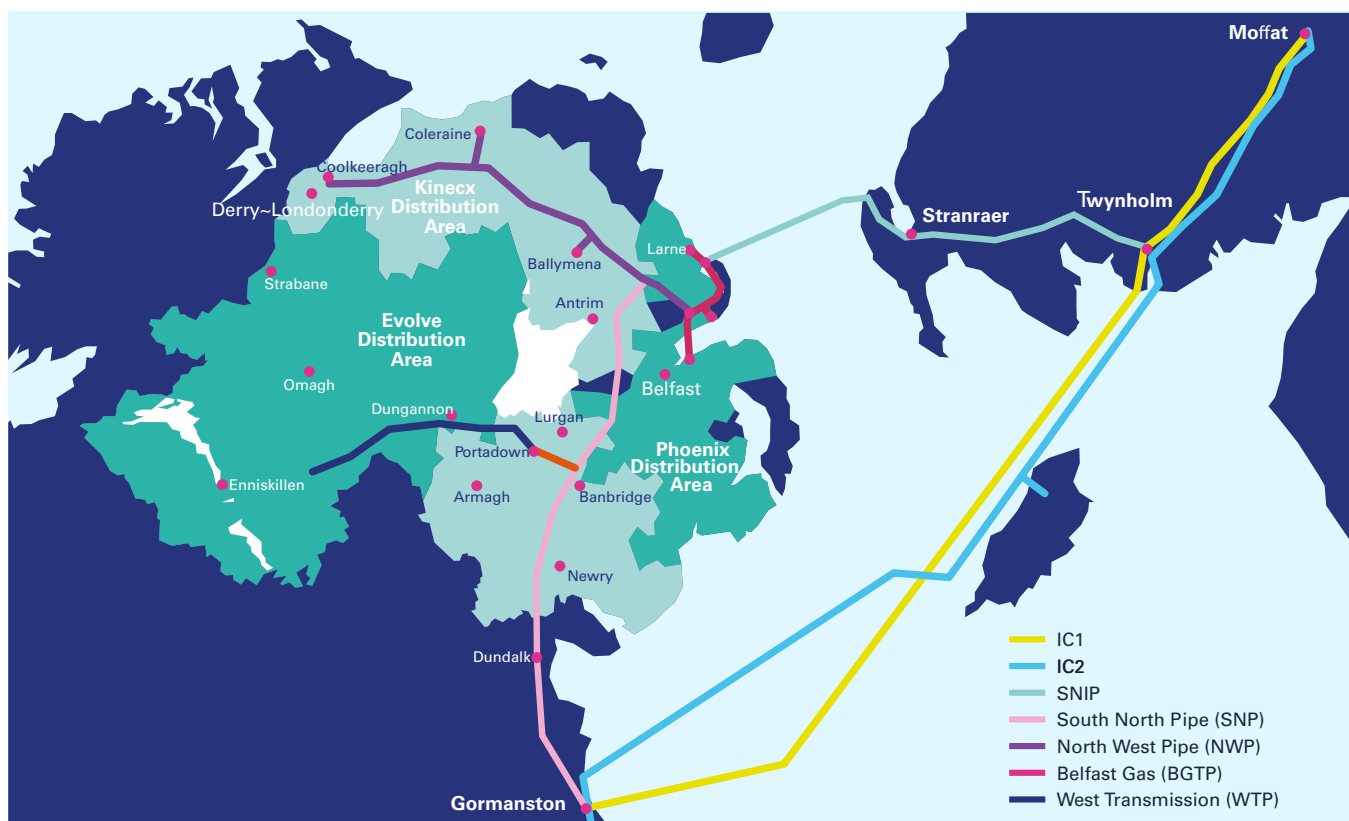


Figure 4 - text

Anaerobic Digestion (AD) and power assets: A platform to scale

Northern Ireland benefits from a well-established AD sector, with approximately 90 plants already operational.⁹ These facilities have proven reliable over the last decade and offer a robust foundation to advance a biomethane sector scale-up. Rather than developing entirely new supply chains, the region can:



Upgrade existing AD plants

for biomethane production including grid injection.



Expand plant capacity using proven designs.



Build new facilities in areas

already served by the gas network to expand supply.

Similarly, thermal power stations, which remain necessary for grid stability and dispatchable capacity for the foreseeable future, can operate on biomethane or can be retrofitted to run hydrogen blends, preserving their value in a net zero context.

Summary

Net zero does not require rebuilding Northern Ireland's energy system from the ground up. Instead, it calls for a smarter, more strategic use of the infrastructure already in place. By repurposing pipelines, adapting existing generation assets, and scaling up renewable gas supply, Northern Ireland can accelerate decarbonisation in a way that is cost-effective, resilient, and socially acceptable. This approach reduces disruption, protects past investment, and ensures that the energy transition is not only ambitious but also grounded in practical, achievable steps.

3.4 Hard to electrify end uses, including high temperature industrial thermal solutions, as well as certain housing stock, can be more economically decarbonised using renewable gas than deep retrofit and electrification.

Electrification will play a central role in decarbonising Northern Ireland's energy system, particularly in areas like personal transport and low-temperature heating. However, there are key segments where electrification is neither technically feasible nor economically practical. For these "hard-to-abate" segments, the gas network will be a key decarbonisation enabler, distributing natural gas in the near term, while renewable gases are expected to offer a more cost-effective and less disruptive pathway to net zero over the longer term.

Biomethane offers a promising pathway for decarbonisation by effectively utilising local resources and employing proven, scalable technology. This renewable gas can play a crucial role in addressing the challenges faced by industrial processes, heavy-duty vehicles, and various segments of the housing stock, all while maintaining economic competitiveness and social equity.

In conjunction with biomethane, hydrogen emerges as a complementary energy source that, although still in its nascent stages in Northern Ireland, possesses significant potential for the future. Together, these renewable gases provide a robust solution for decarbonisation efforts.

Industrial heat: High temperatures, high barriers

Industry and commerce account for a significant share of Northern Ireland's energy use and carbon emissions. Many of these processes rely on high-temperature heat, often exceeding 250°C, which is extremely difficult to supply using conventional electric heat pumps.

Sectors such as the food and beverage industry, glass and ceramics production, along with chemical and pharmaceutical processing all require continuous, high-grade thermal energy i.e. heat. Switching to electric alternatives in these industries typically involves bespoke equipment, substantial capital investment, and an upgraded electricity supply, all of which can be prohibitively expensive and operationally disruptive.

By contrast, renewable gases can offer a more practical solution. Fuels like biomethane and hydrogen can be used in adapted commercial and industrial systems, reaching required temperatures without major system redesign. They are also compatible with existing thermal control systems, helping to preserve product quality and process reliability. For many manufacturers operating on tight margins, renewable gases may represent the only viable route to decarbonisation that avoids relocation or closure.



Heat Pump Energy (TWh) / Installed Heat pumps

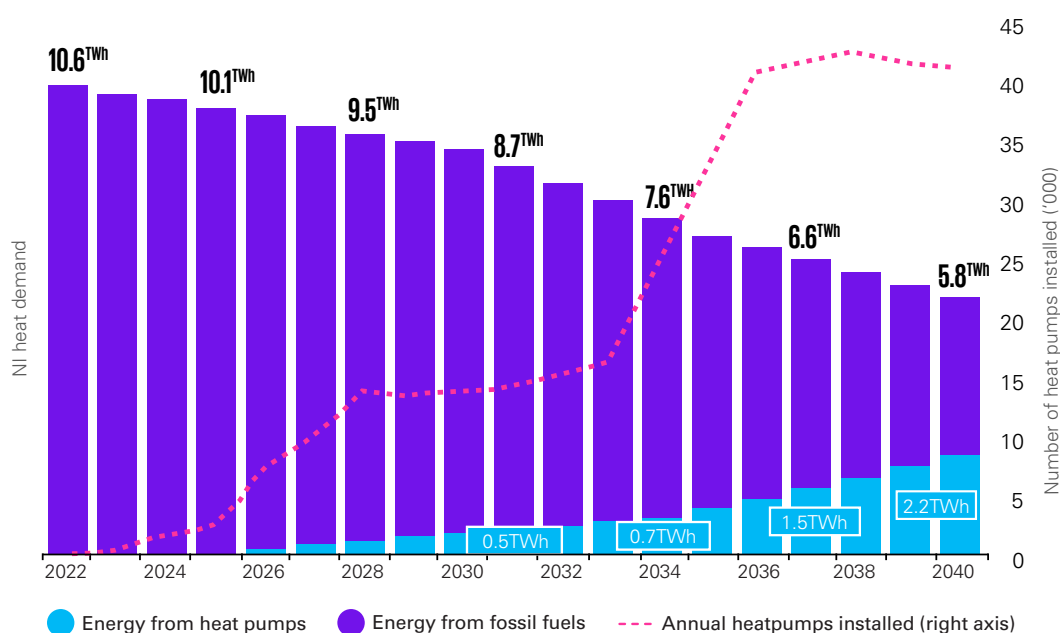
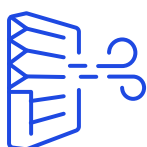


Figure 5 - Projected NI heat pump energy demand as a portion of total residential heat demand¹⁰

Domestic heat: Electrification isn't always practical

While the projected growth in Figure 5 of heat pump installations to 2040 represents a significant step forward to decarbonise heat in Northern Ireland, it is important to acknowledge that:



The initial slow rate of early heat pump adoption suggests that it will be challenging to achieve this level of projected growth.



Growth post 2040 is unlikely to continue at the same level, as remaining housing stock to be retrofitted at this point is likely to be increasingly difficult to retrofit due to technical, financial, or structural constraints.

It is therefore unrealistic to assume that heat pumps alone will meet all residual heat demand and instead a range of additional domestic heating solutions will be required to address these remaining loads. This will include the development of heat networks; however, it is important to note that such deployment is likely to be in bespoke scenarios where they are both practical and economically viable.

There are strong economic, social and system drivers for renewable gases to be part of the domestic heating solution in Northern Ireland, particularly given the unique regional context. Presenting the rationale in clear terms helps to highlight why this pathway merits serious attention:



Housing stock in NI: The average SAP (Standard Assessment Procedure) rating of the housing stock in NI is significantly lower than in other UK regions, reflecting widespread poor insulation and outdated construction methods. Retrofitting these properties for low-carbon electric heating is especially challenging due to solid-wall construction which is difficult to retrofit and has limited thermal performance. Estimates suggest that upgrading the housing stock could require investment of up to £9 billion, underscoring the scale of the challenge.¹¹



Cost of installation: The upfront costs associated with deep retrofits and heat pump installations can be prohibitive for many households, especially in harder-to-heat homes. KPMG has estimated that deep retrofitting and installing a heat pump to a typical household is likely to cost ~£30k.



Consumer journey and practicalities: Transitioning to electric heating often involves significant disruption, including changes to internal heating systems and fabric upgrades, which can be complex and intrusive for consumers and is not typically aligned to when consumers choose to upgrade heating appliances (boiler/system breakdown).



Regional alternatives: Unlike other regions, Northern Ireland has access to a broader set of options, including renewable gases, which could offer a more practical and cost-effective route for certain segments of the housing stock.

Taken together, these factors, alongside KPMG projections that show heat pumps supplying less than 40% of residential heating energy by 2040 make a strong case for renewable gases as a strategic and regionally tailored component of Northern Ireland's decarbonisation pathway.

¹¹ Domestic Buildings Pathway Analysis for Net Zero in Northern Ireland



Hybrid Heating Systems

One effective approach to reducing high retrofit costs is the adoption of hybrid heating systems. These systems integrate an electric heat pump and a renewable gas boiler under a single smart controller, delivering circa 80% of a home's annual space-heating demand via the heat pump. When outdoor temperatures fall and the heat pump's efficiency drops, the controller seamlessly switches to the gas boiler, which is more cost-effective under cold conditions. This strategy can cut peak electricity demand by 20–30%.¹²

The upfront cost of a hybrid boiler is substantially lower than that of a full retrofit and air source heat pump:

~£30,000

Full deep retrofit
plus air-source heat pump

~£15,000

Limited retrofit plus air-
source heat pump

~£9,000

Hybrid boiler upgrade only

A 12-month hybrid trial in South Belfast demonstrated the real-world benefits of this approach. The heat pump supplied 84% of the home's heating, reducing daily fuel costs by 16% compared to a gas-only system and cutting emissions by 51%. A win-win for capex and operating costs whilst also achieving a drastic reduction in carbon emissions in a package which is cost effective to implement in the short-term. Broader analyses from the FREEDOM Project (a trial of smart control technology for hybrid heat pumps) and Cadent supports these findings, showing that hybrid systems can lower whole-system abatement costs, reduce home-heating CO₂ by around 60% today (rising to 80% by 2030 due to a further decarbonised electricity grid), and make use of existing gas infrastructure to deliver flexible, low-disruption support during peak demand.^{13,14}

Achieving net zero therefore demands a pragmatic, financially realistic plan that leverages renewable gas supported hybrid systems to bridge today's retrofit and grid-flexibility challenges. This low-disruption approach is particularly important for low-income households and rural communities, where full electrification may simply not be practical in the near, or long term.

Summary

Decarbonisation must be tailored to the technical and social realities of energy consumers in Northern Ireland. While electrification is a powerful tool, it is not always the most efficient, practical, or equitable option. In industries that require high-temperature heat and retrofit-challenged housing alike, renewable gas offers a scalable and economically realistic alternative, one that supports emissions reduction without placing undue strain on businesses, households, or infrastructure. A successful net zero transition will require both electrons and molecules, applied where they are best suited.

¹² Hybrid Heat Pumps - Department for Business, Energy & Industrial Strategy

¹³ National Grid Freedom project

¹⁴ Cadent - The scope for using hybrid systems in home heating

3.5 Northern Ireland has the natural resources to facilitate the production of both biomethane and green hydrogen on a meaningful scale.

Whilst decarbonisation is a global challenge, it will ultimately be delivered through regionally optimised strategies. Northern Ireland is uniquely well-positioned to contribute meaningfully by producing renewable gases at scale. With physical infrastructure, agricultural feedstock, and significant renewable electricity potential already in place, the region has the foundations in place to support both biomethane and green hydrogen supply chains at scale. These resources can play a central role in delivering a secure, flexible, and low-carbon energy system tailored to Northern Ireland's specific needs and opportunities.

Renewable gases are energy-dense, storable at scale, and for long durations making them well-suited for sectors that are difficult to electrify. By displacing fossil fuels in heating, transport, and industry, renewable gases also help insulate Northern Ireland from the volatility of global energy markets. Renewable gases also provide benefits that can directly support electricity-led decarbonisation. In particular, hydrogen electrolyzers can transform excess renewable electricity during periods renewable generators are dispatched down to valuable green hydrogen, offering a valuable revenue stream for wind generators for zero carbon electricity that would otherwise go to waste.

Biomethane: A scalable, mature opportunity

Northern Ireland is already ahead of many regions in renewable gas development thanks to its established anaerobic digestion sector. Around 90 AD plants are currently operational, and most are used to generate renewable electricity rather than provide renewable gas to customers.¹⁵ These facilities provide an existing technical, regulatory and skills base that can support a rapid pivot to biomethane production and grid injection.

Local feedstock availability is a key strength in Northern Ireland. Research by Queen's University Belfast, conducted through the CASE programme, estimates that over 6 TWh per year of biomethane could be sustainably produced from housed livestock slurry and underutilised grass silage. Notably, this potential lies largely within 10 km of the existing gas network, reducing the cost and complexity of distribution.

¹⁵ Energy Ireland – The Future of Anaerobic Digestion in Ireland





Delivering a currently proposed Gas Network Operators 2030 target of 1.5 TWh of biomethane production would represent nearly 20% of current distribution network natural gas demand in Northern Ireland. The NI Biomethane Request For Information in NI indicates that there are 84 AD projects in development with a total capacity 3.4 TWh, indicating support from developers. Hitting the 1.5 TWh target would also deliver an estimated 1,400 rural jobs in typically low-income regions and avoid 1.2 million tonnes of cumulative CO₂ emissions between 2024 and 2030, with substantial benefits for the agriculture sector.¹⁶

Perhaps most importantly, biomethane can use Northern Ireland's existing 6,247 km gas distribution network and requires only minimal reinforcement. Infrastructure originally built for fossil fuels now provides a pathway for rapid, capital-efficient decarbonisation of the energy system.

Green hydrogen: Long-term potential with strategic value

While green hydrogen is less commercially mature than biomethane, both gases offer distinct yet complementary roles in the energy transition. Biomethane provides an immediately deployable solution for decarbonising heat, particularly in hard-to-electrify buildings. Green hydrogen, meanwhile, offers long-term strategic value as a storable form of renewable electricity and a versatile zero-carbon fuel. Together, they can support a more resilient and flexible energy system, biomethane delivering near-term impact, and hydrogen enabling additional decarbonisation solutions across heat, transport, and industrial sectors over time.

Northern Ireland's wind resource, one of the best in Europe, makes it an ideal location for electrolytic hydrogen production. Surplus wind generation, which might otherwise be dispatched down, can be converted into hydrogen for storage or downstream use.

The polyethylene pipelines that make up the distribution gas network in Northern Ireland are well placed to handle hydrogen blends of up to 20% without the need for appliance replacements, enabling a phased transition as production scales to allow 100% hydrogen volumes to targeted end users in regions where this is desirable.

The network also acts as a demand sink, supporting early-stage hydrogen projects by providing a scalable and accessible route to market.

¹⁶ Supporting a renewable gas sector in Northern Ireland



Summary

Renewable gas production isn't a distant ambition; building a biomethane economy is an immediate opportunity already gaining momentum across Europe. In Denmark, biomethane now supplies over 40% of the national gas grid¹⁷, proof of what sustained policy and infrastructure support can achieve. The REPowerEU plan further aims to deliver 35 billion cubic metres of sustainable biomethane per year by 2030.¹⁸ In the UK, the Future Energy System 2025 report by NESO highlights biomethane as a key component in achieving net zero, signalling significant anticipated growth in its domestic production and use.¹⁹

Northern Ireland is already well-placed to scale biomethane, with infrastructure and supply chains in place and a regulated framework that supported the first gas to grid injection in NI at Granville Eco Park in November 2023. By capitalising on existing strengths, including agricultural capacity, wind energy, and gas infrastructure, the region can unlock major environmental, economic and energy security benefits. Renewable gases are not just complementary to electrification; they are essential to achieving a practical, whole-system pathway to net zero.

¹⁷ Biogas production and use in Denmark

¹⁸ European Commission

¹⁹ NESO Future Energy Systems 2025

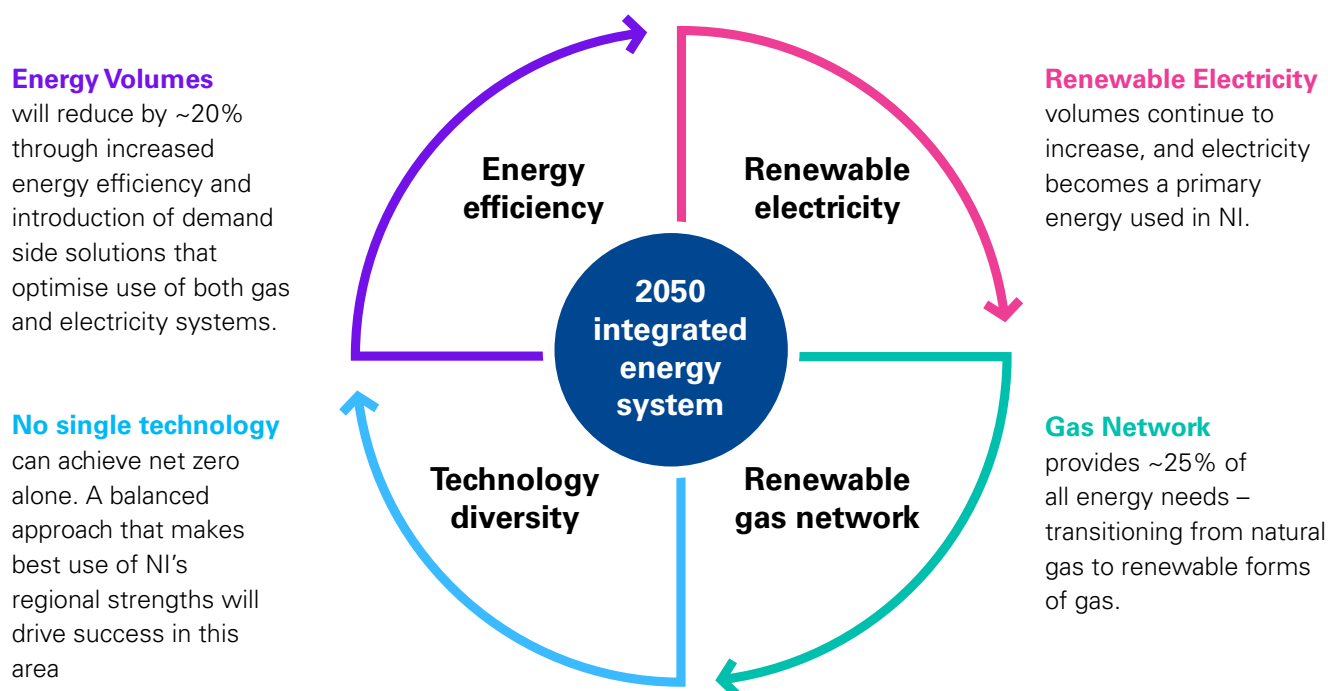
Conclusion: A unified, practical path to net zero

Building an integrated energy system where renewable electricity and renewable gases work hand in hand is essential. Renewable electricity will be the driving force behind our transition to a low-carbon future, but its variability and the diverse needs of heat, transport and industry demand dispatchable, renewable gases to support regional energy system needs.

Between 2025 and 2050, the role of Northern Ireland's gas network will evolve from transporting fossil gas to a network that distributes renewable gas solutions to a range of end user sectors.

To unlock that potential, it is essential to dedicate proportional focus, policy support, and investment toward renewable gas solutions. By harnessing Northern Ireland's existing networks, natural resources, and technical strengths, and by forging deep partnerships across the electricity and gas sectors, stakeholders can deliver an energy system that is secure, affordable, and truly resilient on the journey to net zero.

A 2050 integrated energy system – our view:





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