Gas Networks Ireland

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Network Development Plan

2024

Contents

Data Freeze and Rounding
In order to complete the detailed analysis and modelling required to produce this document, the demand and supply scenarios were defined in September 2024, based on the most up to date information at the time. In presenting the data obtained for publication in the Network Development Plan, energy values have been rounded to one decimal place, and aggregated growth/contraction rates are expressed as whole numbers to aid clarity. In certain cases, rounding may lead to slight variance in sum totals.

Disclaimer
Gas Networks Ireland has followed accepted industry practice in the collection and analysis of data available. However, prior to taking business decisions, interested parties are advised to seek separate and independent opinion in relation to the matters covered by the present Network Development Plan and should not rely solely upon data and information contained therein. Information in this document does not purport to contain all the information that a prospective investor or participant in the Republic of Ireland's gas market may need.

1. Foreword

Welcome to the 2024 Network Development Plan (NDP) published by Gas Networks Ireland. This document examines current gas demand and supply projections for the coming 10-year period, and provides a view of how the gas network may be required to develop to meet these projections. This assessment of gas network capacity aims to ensure the adequacy of the gas transportation system and security of supply. The projections have been developed with internal input from throughout Gas Networks Ireland and the document has been produced following a process of engagement and informal consultation with key industry stakeholders. As a result, the scenarios presented in the NDP represent a prudent assessment of national policy in Ireland.

Ronan Galwey Chief Executive Officer

Gas Networks Ireland provide approximately 716,000 households and businesses with a reliable and competitive source of heating each year. The gas network continues to play a key role within Ireland's energy system, providing almost 30% of the country's primary energy needs, accounting for 40% of final energy demand for heating and supplying 40% of Ireland's electricity demand.

National energy policy is a key input in the formation of the NDP modelling assumptions. The most recent update to the Climate Action Plan[1] (CAP) reinforced the ambitious national decarbonisation targets for 2030. In order to deliver on these carbon budgets and renewable energy share by sector targets over the next five years, a rapid scale-up of alternative and renewable energy infrastructure is needed across all sectors. Public buy-in and government incentives and support for nascent industries will heavily influence whether these targets are met within the timelines set out in the CAP. While Gas Networks Ireland welcome and recognise the need for this ambition, in order to ensure prudent planning for the gas network from a security of supply point of view, the NDP's Best Estimate scenario assumes that some of these targets are delayed in being met. This approach is supported by other key external stakeholder assessments which highlight a likely delay in meeting the carbon budget targets set for 2030 based on current trajectories[2]. The NDP Low scenario broadly assumes that the CAP targets are met on-time while the High scenario assumes further delays in these targets being achieved.

With gas demand for power generation accounting for almost 60% of current ROI annual gas demand, forecast demand in this sector is expected to have the biggest influence on the trajectory of total demand over the coming ten years. As a result, ROI annual gas demand is forecast to decrease in two of the three NDP scenarios, the Low and Best Estimate scenarios, while in the High scenario Gas Networks Ireland expect gas demand to increase. Actual gas demand for power generation will depend on the growth trajectory for electricity demand coupled with the speed at which renewable generation can displace baseload gas capacity.

Across all three NDP scenarios, Residential demand is projected to decrease owing to a forecast reduction in the number of residential gas customers based on projected heat pump and district heating targets and energy efficiency improvements for existing customers. Industrial and Commercial (I&C) demand is forecast to increase across the NDP period in both the Best Estimate and High scenarios, owing to new customer connections, coupled with modest projected economic growth. The Low scenario forecasts a decrease in demand in this sector owing to projected disconnections from the network with the uptake of alternative heating technologies to gas.

In contrast, the NDP forecasts an increase in ROI peak day gas demand across the 10-year period in both the Best Estimate and High scenarios. This is driven by the expected continued reliance on gas-fired power generation to deliver the majority of electricity demand on days of low renewable availability. The forecast decrease in peak day gas demand in the Low scenario is owing to less reliance on gas-fired generation to satisfy peak electricity demand, alongside a larger forecast decrease in residential peak day demand.

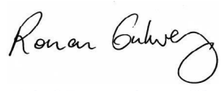
Given the scope for growth in the peak day demand, the current technical supply capacity at the Moffat Entry Point in Scotland is projected to be exceeded in the latter eight years of the forecast horizon. Gas Networks Ireland is progressing a series of incremental capacity upgrade works at both compressor stations in Scotland to meet these forecasted 1-in-50 peak day demands.

Within the time horizon of the NDP, there is a strong drive towards displacing natural gas in the network with renewable gases such as biomethane and green hydrogen. This transition is supported by both the National Hydrogen Strategy[3] and the National Biomethane Strategy[4]. All NDP scenarios forecast that annual natural gas demand will decrease between 2023/24 and 2032/33 while conversely the volume of renewable gases is forecast to increase in all scenarios across the same period. Consequently, annual carbon emissions from the gas network also decrease in all NDP scenarios across the 10-year period.

To facilitate the growth of the biomethane industry, Gas Networks Ireland has developed a new connection policy and standardised design for biomethane suppliers looking to connect directly to the gas network. A further new connection policy for centralised Grid Injection (CGI) facilities is in development. Gas Networks Ireland is also progressing a range of work packages to ensure the gas network is ready to transport hydrogen, initially via blending across the interconnectors and in dedicated 100% hydrogen clusters, and ultimately scaling up to a national hydrogen network.

Ireland has committed to and legislated for net-zero emissions by 2050; utilising and decarbonising the national gas network is vital to achieving this target. Gas Networks Ireland is committed to proactively supporting this ambition through the delivery of a net-zero carbon gas network[5] by gradually replacing natural gas with renewable gases, such as biomethane and green hydrogen. As part of the new Price Control 5 Flexibility and Adaptability Incentive , Gas Networks Ireland are responsible for delivering the new biennial Core Flexibility Report (CFR), the first of which will be published for public consultation in 2025. The aim of the CFR is to determine and support long-term adaptive planning, usage and investment requirements for the gas network for the next 10-15 years.

Gas Networks Ireland recognise the importance of increased integration of energy system scenario planning, given the significant interdependencies between the gas and electricity networks, as highlighted in Energy Security in Ireland to 2030 report Action 22, in the National Hydrogen Strategy and in the EU Hydrogen and Gas Market Decarbonisation Package[6]. With this in mind Gas Networks Ireland are actively engaging with the electricity TSO EirGrid to discuss further alignment of future demand assumptions and scenarios.



Chief Executive Officer, Ronan Galwey

1 Climate Action Plan 2024
2 Ireland's Greenhouse Gas Emissions Projections 2023-2050
3 National Hydrogen Strategy
4 Ireland's National Biomethane Strategy - May 2024
5 Pathway to a Net Zero Carbon Network
6 Directive (EU) 2024/1788

2. Executive summary

Key Messages:

- Gas Networks Ireland continued to provide uninterrupted gas supply to c. 716,000 customers throughout 2024 through a network of 14,725 km across 22 counties in Ireland.

- The ROI peak day and annual gas demand forecasts diverge over the coming 10-year NDP horizon
  - ROI annual demand is forecast to decrease by 14% by 2032/33 in the Best Estimate scenario. This forecasted decline in annual gas demand is primarily driven by the increasing penetration of renewable power generation across the 10-year NDP period, displacing gas-fired power generation on an annual basis. The second main driver is the forecast disconnection of Residential and Commercial customers due to the uptake of alternative heating technologies.
  - In the Best Estimate demand scenario, the ROI 1-in-50 winter peak day demand[7] is predicted to grow by 6%. This projected increase in peak day gas demand is driven by the requirement for gas-fired electricity generation to meet the majority of the growing electricity demand on days of low renewable generation.

- The technical supply capacity at the Moffat Entry Point in Scotland will increase from 2025/26 onwards. Gas Networks Ireland is actively progressing a series of incremental capacity upgrade works at both compressor stations in Scotland in order to meet the forecasted 1-in-50 peak day demands.

- Within the time horizon of the NDP, renewable gases such as biomethane and green hydrogen are anticipated to play a larger role in meeting gas demand and will offset the decline in indigenous gas supply from the Corrib gas field. Biomethane and hydrogen supply sources are forecast to meet approx. 18% and 4% of ROI gas demand respectively by the end of the NDP period. By replacing natural gas with renewable gases, such as biomethane and green hydrogen, the decarbonised gas network would enable emission reductions across key sectors, including those that are traditionally difficult to decarbonise, such as transport, agriculture, industrial processes and power generation.

- CO_2 emissions relating to gas demand in the Best Estimate scenario are forecast to decrease by 33% across the NDP horizon. This is driven by both the decrease in annual ROI demand combined with the projected increase in renewable gases on the network, directly replacing natural gas.

7 A severe winter peak day that is statistically likely to occur once every fifty years

The assessment horizon of this report covers the 10-year period from gas years 2023/24 to 2032/33 inclusive. The input data and assumptions used for modelling gas supply and demand scenarios over the 10-year period were finalised by October 2024, in line with the modelling 'Data Freeze' date. Further to this modelling Data Freeze, the production of the report extended to November 2024, and hence any non-modelling information such as national and European energy policy developments, project status and other ancillary developments in the gas and wider energy industry are included up to 30th November 2024.

Given the wide scope of input assumptions, and the considerable uncertainty in the trajectory of both gas and electricity demand over the NDP horizon, three scenarios have been developed and are examined as part of the NDP: Low, Best Estimate and High gas demand scenarios. These scenarios aim to capture the potential impact on both annual and peak day gas demand with a view to ensuring adequate capacity on the gas network to meet customer demand.

In the Best Estimate scenario, annual ROI gas demand is expected to fall by 14% between 2023/24 and 2032/33. Similarly, in the Low demand scenario, a decrease in ROI gas demand of 49% is predicted over the same horizon. In contrast, the High demand scenario forecasts an increase in annual gas demand of 16%. The decrease in the Best Estimate and Low scenarios is primarily driven by the anticipated fall in gas demand in the Power Generation sector, followed by the projected decrease in the Residential sector. The trend in Power Generation demand is linked to the ambitious build-out rates assumed in both scenarios for wind and solar generation in Ireland. This offsets the potential for gas demand growth due to forecast electricity demand growth. Assumptions for wind and solar capacity development rates in the Best Estimate scenario are based on the build-out profiles provided in the draft EirGrid / SONI National Resource Adequacy Assessment (NRAA) 2025-2034, reaching 19.5GW of installed renewable capacity in 2033. The Low gas demand scenario meets the ambitious CAP 2024 renewable capacity target of 22GW in 2031, growing to 26.8GW in 2033. As regards the High scenario, projected ROI demand growth out to 2032/33 is driven by growth of 16% in Powergen demand. In this scenario, growth in electricity demand outstrips growth in renewable generation, with renewable capacity reaching 12.9GW in 2033.

Industrial & Commercial (I&C) demand is expected to increase in both the Best Estimate and High gas demand scenarios, by 11% and 19% respectively, by 2032/33. The forecasted increase in gas demand related to new Large Energy User (LEU) connections in the I&C sectors, coupled with moderate projected economic growth, offsets the anticipated decrease in gas demand due to the implementation of energy efficiency measures along with I&C disconnections due to the uptake of heat pumps and district heating. I&C demand is forecast to decrease in the Low scenario by 4% between 2023/24 and 2032/33 due to higher levels of gas disconnections in this scenario offsetting any growth related to one-off new connections and economic growth.

Gas demand in the Residential sector, taking account of the targets announced in updates to the Climate Action Plan to date, is projected to decline across all scenarios; this is as a result of significant reductions in new connections, coupled with an anticipated increase in disconnection rates related to the uptake of heat pumps and the introduction of district heating schemes at scale. Increasing energy efficiency is also taken into account across the NDP horizon in all scenarios. The Low, Best Estimate and High scenarios forecast reductions of 47%, 26% and 6% respectively in the Residential sector gas demand across the NDP horizon.

In contrast, the development of peak day demands across the various scenarios diverges when compared to the annual demand forecasts. Over the forecast horizon, both the ROI 1-in-50 peak day demand and average peak day demand are predicted to grow by 6% in the Best Estimate demand scenario between 2023/24 and 2032/33. There is decoupling of peak day and annual gas demand in the power generation sector due to the growing reliance on gas-fired electricity generation to compensate for low renewable generation on high electricity demand days. In the High scenario, 1-in-50 peak day demand and average winter peak day demand are expected to increase by 26% and 22% respectively across the NDP horizon. Only the Low scenario is expected to decrease overall, with the 1-in-50 peak forecast falling by 14% and the average winter peak day decreasing by 11%.

Towards the end of the period, with the extra electricity interconnection available in the electricity system, this has a slight dampening effect on the peak day gas demand. Typically, on the peak day, it is assumed that the SEM will be net importing. Depending on electricity market dynamics in neighbouring jurisdictions, it is possible that electricity imports may not be available to this extent on the peak day. This possibility is explored in a sensitivity where the impact of the largest interconnector operational in a given year is on a forced outage is modelled, resulting in an increase in peak day gas demand of 14% across the 10-year horizon, up from 6% in the base case Best Estimate scenario.

The 1-in-50 ROI peak day forecast for the Best Estimate demand scenario is expected to reach its highest point across the NDP horizon in 2025/26, which equates to 11% growth between 2023/24 and 2025/26. Similarly, 1-in-50 system peak day forecast for the Best Estimate demand scenario is expected to reach its highest point across the NDP horizon in 2025/26, which equates to 10% growth between 2023/24 and 2025/26. Capacity on the gas interconnector pipelines is adequate to meet all gas demand projections over the 10-year horizon. The current technical supply capacity at the Moffat Entry Point in Scotland, at the associated compressor stations, would be exceeded in the latter eight years of the forecast horizon, based on forecasted demand. Gas Networks Ireland is progressing a series of incremental capacity upgrade works at both compressor stations in Scotland, with completion targeted for winter 2027/28, to securely meet the forecasted 1-in-50 peak day demands.

The Data Centre market continues to seek further growth opportunities in Ireland. New demand, which could not be met solely by the electricity grid, led to some Data Centres taking the decision to complement fixed capacity electricity grid connections with on-site electricity generation, specifically gas-fired engines often combined with heat recovery. Other contracted demand, some since connected and with some due to connect to the gas network in the coming years, may use gas solely as a back-up to their electrical connection or, conversely, gas may be their primary fuel source due to the absence of an electrical grid offer.

In July 2022, the Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy[8] set out a series of principles to inform and guide decisions on future Data Centre development. There is a clear preference for Data Centre developments that can demonstrate the additionality of their renewable energy use in Ireland and can demonstrate a clear pathway to decarbonise and ultimately provide net zero data services. Gas Networks Ireland believes that Data Centres connecting to the gas network have the potential to meet these principles through the use of biomethane and green hydrogen while simultaneously assisting in establishing indigenous renewable gas markets in Ireland.

Since the publication of the Government Statement in July 2022, new Data Centre connection enquiries to the gas network have been paused. At the time of finalising this report, the proposed decision paper on Large Energy Users (LEU) connection policy was just published by the CRU which sets out a potential pathway for prospective LEU and data centre connection applications to the electricity grid. The CRU is not proposing to introduce any new decisions relating to connections to the gas network as part of the LEU policy review process. For the purposes of this NDP horizon, all scenarios include only those Data Centre customers with connection agreements already in place prior to the Government Statement on the role of data centres and prior to the proposed LEU Connection Policy publication. These Data Centres customers with connection agreements already in place only represent a portion of the total enquiries received from Data Centres by Gas Networks Ireland to date.

Following the publication of the LEU connection policy, Gas Networks Ireland will reassess the potential for any additional data centre connections in our gas demand forecasts. If significant additional gas demand materialised, it would have a corresponding impact on NDP forecasts, and GNI may need to consider further measures to manage additional connections to the gas network in order to maintain security of supply, particularly during severe winter peak demand periods.

By the end of the NDP horizon, Gas Networks Ireland expects to see annual bioCNG demand for HGVs in the Transport sector of circa 380 GWh/yr in both the Low and Best Estimate scenarios, supported by a network of 21 CNG refuelling stations. This equates to circa 65ktCO2-eq annual emissions savings when the bioCNG stations reach their anticipated capacity when compared with the alternative scenario that such HGVs are powered by natural gas. In the High scenario, Gas Networks Ireland is expecting annual bioCNG demand of c. 1,150 GWh p.a., with 71 stations in operation by the end of 2033, resulting in annual savings of c. 210 ktCO2-eq.

Within the time horizon of the NDP, there is a strong drive towards replacing natural gas in the network with renewable gases such as biomethane and green hydrogen. Gas Networks Ireland commissioned the first biomethane gas grid injection facility in 2019. In calendar year 2023, 60GWh of biomethane was injected into the gas grid at this connection point, offsetting 11 kTCO2-eq. In the Best Estimate scenario, renewable gases are forecast to grow from 0.1% of ROI demand in 2023/24 to account for just over 22% of demand by 2032/33, resulting in a saving of 1.8Mtonne CO2-eq relating to natural gas CO_2 displaced. Given also that total ROI gas demand is forecast to decrease by 14% across the NDP horizon, natural gas volumes in the ROI network are forecast to decrease by 23% across the period. Hence, the share of natural gas demand within the ROI network is forecast to fall from c. 99.9% today to c. 78% by the end of the NDP horizon.

As previously mentioned, delivering on Ireland's increased ambition for biomethane production to 5.7TWh by 2030, is one of Gas Networks Ireland's key priorities. Gas Networks Ireland facilitates direct grid injection projects through a connection policy framework. An additional connection policy framework for Central Grid Injection is in development to support remote cluster developments. Led by Gas Networks Ireland, the GRAZE (Green Renewable Agricultural Zero Emissions) project will deliver the first large scale CGI facility in Ireland near Mitchelstown, Cork by the end of 2025, taking biomethane from plants in its catchment area and injecting it into the gas network. Biomethane suppliers can also connect directly to the transmission or distribution network;

8 government-statement-on-the-role-of-data-centres-in-irelands-enterprise-strategy.pdf

to date, four biomethane supply contracts have been executed, with expected connection dates in 2025 and 2026, with a further nine connections offers issued to potential producers. These 4 new connections will provide a further c. 200 GWh of biomethane supply p.a. to the gas network. Gas Networks Ireland welcome new biomethane connection enquiries and are continually assessing their viability for connection to the gas network.

The Best Estimate scenario forecasts that the CAP 2024 biomethane production target of 5.7TWh for 2030 is slightly behind target, with 5.7TWh of annual production forecast for 2031. The High scenario meets the biomethane target by the start of 2031. Both of these scenarios assume that the infrastructure is in place to support the 5.7TWh target by the end of 2030, with the limiting factor being the ramp up in production onsite. This trajectory reflects the volume of biomethane production plants that need to be built and connected to the gas network in the next 6 years to support the biomethane industry. Biomethane supply in each of these scenarios increases by 2033 to 8.2TWh in the Best Estimate scenario and 9.5TWh in the High scenario. The Low scenario misses the 5.7TWh target within the 10-year NDP horizon, with production of 3.8TWh expected by 2033. This alternative trajectory reflects the potential challenge to growth of the biomethane sector in the absence of or in the event of a delay to the required policies and incentive schemes, such as the Renewable Heat Obligation.

From 2030 onwards, growth in the supply and transportation of green hydrogen within the gas network is forecast, with supply of c. 0.4TWh projected for 2029/30, rising to 1.9TWh by 2032/33. Hydrogen is expected to be supplied from both indigenous sources, i.e. from surplus renewable generation, and via imports from GB in the form of Hydrogen blends in the existing gas interconnectors. This supply forecast is dependent on the successful build-out of dedicated offshore wind for the production of green hydrogen through electrolysis. The EU hydrogen and gas decarbonisation package requires Member States to be ready to accept 2% blends (by volume) via interconnection with other Member States; actual volumes entering Gas Networks Ireland's network will vary depending on the flow of H2 in GB's National Transmission System (NTS)[9]. In the longer-term, Gas Networks Ireland expect growth in the supply of Hydrogen to continue beyond 2033, ultimately replacing natural gas in demand sectors such as high-heat industrial processes and the deployment of hydrogen-fired electricity generation.

9 While GB is not an EU Member State, it is expected that GB will comply with this criteria of accepting 2% blends of hydrogen from Member States as defined in the EU hydrogen and gas decarbonisation package

3. Introduction

Key Messages:

- The gas network currently has a total length of 14,725km, comprising 2,477 km of high-pressure steel transmission pipelines and 12,248 km of lower pressure polyethylene distribution pipelines.
- Natural gas is available in 22 counties, serving c. 716,000 gas customers across the Powergen, Industrial & Commercial, Residential and Transport sectors.

3.1. Licence/regulatory obligations

Gas Networks Ireland was established in accordance with the Gas Regulation Act 2013, as amended. It owns and operates the natural gas transmission and distribution networks in Ireland. As Ireland's gas Transmission System Operator (TSO), Gas Networks Ireland is required to submit a 10-year Network Development Plan to the CRU in accordance with Article 22 of EU Directive 2009/73/EC and Article 11 of the EC1 (Internal Market in Natural Gas and Electricity) (Amendment) Regulations 2015. The Network Development Plan (NDP) is based on current gas supply and demand, projections for growth in gas consumption and development of gas supply and transportation infrastructure.

In June 2024, Directive 2009/73/EC was repealed and replaced by Directive (EU) 2024/1788 on common rules for the internal markets for renewable gas, natural gas and hydrogen. Under Directive (EU) 2024/1788, TSOs are required to submit a ten-year network development plan at least every two years. Hence, once Directive (EU) 2024/1788 is transposed into Irish law, the publishing schedule for the NDP is expected to be amended to align with this Directive at the point at which it is enacted.

Gas Networks Ireland is also obliged to submit a long-term development statement to the CRU in accordance with condition 11 of its TSO and Distribution System Operator (DSO) licences. The publication of the NDP also satisfies the requirements of Section 19 of the Gas (Interim) (Regulations) Act 2002, as amended by the European Communities (Security of Natural Gas Supply) Regulations 2007 (S.I. No. 697 of 2007). This requires the CRU to monitor and publish a report outlining gas supply and demand in Ireland over seven years.

Under the Trans-European Energy Infrastructure Regulation (TEN-E), Gas Networks Ireland is obliged to confer with regional groups on relevant regional and national infrastructure plans. TEN-E provides the legislative basis for 'Projects of Common Interest' (PCI) designation, which refers to cross border energy infrastructure projects that link the energy systems of EU countries. Benefits associated with PCI status include accelerated planning, preferential regulatory treatment, and in most instances, the ability to apply for EU grant funding via the Connecting Europe Facility.

In June 2022, the revised TEN-E regulation (EU 2022/869) was published, aiming to re-focus TEN-E away from traditional gas infrastructure projects towards low carbon solutions such as biomethane, hydrogen and smart gas grid solutions. As a result, the 20 natural gas projects which were included in the previous 5th PCI list published by the European Commission in October 2021, have been removed from the 6th PCI list published in November 2023. While Gas Networks Ireland currently has no projects on the 6th PCI list, this list includes 65 new Hydrogen projects, indicating the availability of funding opportunities for future hydrogen projects related to the gas network.

3.2. Environmental and planning considerations

The purpose of the NDP is to assess the gas network's capacity based on existing and forecast supply and demand to guarantee the adequacy of the gas transportation system and security of supply. While the NDP outlines a number of capital projects, and new technologies, which will be delivered over the coming years, these projects are subject to the appropriate consenting and planning regimes as set out under the Gas Acts 1976 to 2009, the Planning and Development Acts 2000 to 2011 and other relevant National and European law. In order to assist with its obligations in this regard, Gas Networks Ireland implements an environmental and planning assessment procedure for works designed and planned by Gas Networks Ireland. This procedure includes an environmental assessment tool known as 'envirokit' supported by a guidance document known as 'enviroplan'. Together they are a bespoke environmental planning and assessment tool modelled on environmental legal and regulatory requirements and best environmental practice, including requirements pursuant to the EIA Directive (85/337/EEC), as amended and the Habitats Directive (92/43/EEC) and EU Birds Directive (2009/147/EC), as amended. This procedure ensures that environmental and planning matters and appropriate mitigation measures are considered and communicated during the design and project planning stages of all Gas Network Ireland projects.

3.3. Overview of the Gas Networks Ireland system

Gas Networks Ireland maintains, operates and develops Ireland's world-class gas infrastructure, consisting of over 14,725 km of gas pipelines and two sub-sea interconnectors connecting Ireland to the GB network.

The Gas Networks Ireland transmission network includes the onshore ROI network, two subsea interconnectors between ROI and Scotland, one of which also serves the Isle of Man (IOM) market, two compressor stations in Scotland at Beattock and Brighouse Bay and twin onshore pipelines in Scotland. The interconnector system is connected to GB's NTS at Moffat in Scotland. Gas is supplied to the Northern Ireland (NI) market via a separate interconnector from Twynholm, Scotland and can also be supplied via the South-North interconnector connecting Gormanstown AGI, Co. Meath to the NI network.

From just 31 km of transmission pipeline in 1978, the Gas Networks Ireland network has extended to 2,477 km of high-pressure steel transmission pipelines and 12,248 km

lower pressure polyethylene distribution pipelines, as well as Above Ground Installations (AGIs), District Regulating Installations (DRIs), compressor stations, Compressed Natural Gas (CNG) stations and a biomethane injection point. AGIs and DRIs are used to control and reduce pressures on the network.

The ROI onshore part of the system consists primarily of a ring-main system with spur lines serving various network configurations.

The gas infrastructure is differentiated by the following pressure regimes:

- High pressure transmission infrastructure which operates above 16 barg; and
- Distribution infrastructure which operates below 16 barg.

The distribution infrastructure is typically operated at 4 barg and less than 100 mbarg for inner city networks.

The natural gas network has demonstrated resilience and reliability through severe winter weather conditions, particularly during January 2010 and December 2010 when prolonged sub-zero temperatures were recorded. During late 2017 and early 2018, the gas network again demonstrated its resilience through extreme weather events, when storms Emma and Ophelia hit, with no loss of gas supply to households, businesses or the power generation sector. Gas demand has since surpassed the levels seen during these events, and Gas Networks Ireland continue to meet this increased demand without any loss or interruption to supply. The gas network is available in 22 counties and there are circa 716,000 customers. Gas Networks Ireland is responsible for connecting all new gas customers to the network, and for work on service pipes and meters at customers' premises, on behalf of all gas suppliers in Ireland.

Figure 3-1: Overview of the Gas Networks Ireland transmission system

4. The role of the gas network in decarbonising Ireland's energy system

Key Messages:

- Gas Networks Ireland welcomes the urgency and ambition set out in the Climate Action and Low Carbon Development (Amendment) Act 2021, the Programme for Government and subsequent Climate Action Plan updates in 2023 and 2024.
- Ireland has committed to and legislated for net-zero emissions by 2050; utilising and decarbonising the national gas network is vital to achieving this target. Gas Networks Ireland is committed to proactively supporting this ambition through the delivery of a net-zero carbon gas network by 2045[10] by gradually replacing natural gas with renewable gases, such as biomethane and green hydrogen.
- Gas Networks Ireland strongly welcomes national strategies which offer clear development pathways, sectoral targets and financial incentives to remove barriers to the growth of renewable gas production. These include:
  - The National Hydrogen Strategy, published in July 2023, which outlines the future role green hydrogen and the gas network will play in specific areas of Ireland's energy system, enabling the decarbonisation of hard-to-abate sectors such as transport, industrial heating and power generation. Gas Networks Ireland looks forward to the development of an action plan during 2025 by DECC to deliver this strategy.
  - The National Biomethane Strategy, published in May 2024, which sets a target of 5.7TWh of biomethane supply for 2030 and introduced an initial €40 million Biomethane Capital Grant Scheme to stimulate growth in the industry.
- Gas Networks Ireland welcomes the policy requirement for greater energy system scenario planning integration as called for in the National Hydrogen Strategy and in the Energy Security in Ireland to 2030 report. The Energy Security in Ireland report acknowledges the significant interdependencies between the gas and electricity networks, and that these interdependencies will become more important with the increasing penetration of both renewables and renewable gases in the energy system.
- The development of a hydrogen economy at scale in Ireland will require significant connectivity between areas of supply of hydrogen and its end use. Gas Networks Ireland has commenced a range of work packages to ensure the gas network will be ready to support the transport of hydrogen initially via blending and with 100% hydrogen networks in clusters, evolving to a national hydrogen network through the linking of clusters and conversion of existing pipelines as the production of hydrogen and demand increases. Gas Networks Ireland's pathway to a net-zero carbon network sets out how the current natural gas network can potentially evolve into two networks, a hydrogen network and a biomethane network.

10 Pathway to a Net Zero Carbon Network

As noted in Section 3, the purpose of the NDP is to assess the gas network's capacity based on existing and forecast supply and demand in order to guarantee the 10-year adequacy and security of supply of the gas transportation system. The supply and demand assumptions which define the scenarios presented in this NDP are based on a prudent assessment of current energy policy in Ireland.

The Best Estimate scenario aims to align with the existing policy measures in place at the time of the NDP modelling Data Freeze, including, for example, the Climate Action Plan (CAP) 2024. There is a high level of ambition in some of the decarbonisation targets included in this policy document which will pose significant delivery challenges within the period to 2030. As a result, the NDP Best Estimate scenario achieves a significant portion of the measures outlined in the CAP 2024, however meeting the relevant targets that influence gas demand is delayed beyond the end of the NDP horizon. The High NDP scenario assumes a slower decarbonisation trajectory to the Best Estimate, while the Low NDP scenario is fully aligned with the ambitious decarbonisation policy included in CAP 2024.

Further to the above energy policy publications, Ireland's previous[11] Programme for Government (PfG)[12], published in June 2020, sets a commitment to reducing overall greenhouse gas emissions by 7% per annum from 2021 to 2030, with the aim of achieving net-zero emissions by 2050. The Climate Action and Low Carbon Development (Amendment) Bill 2021 also sets a commitment to net-zero emissions by 2050. In 2022, a carbon budget programme comprising of three 5-year budget periods and sector-specific emissions ceilings, operating within the parameters of the carbon budgets, were approved by the Government and came into effect. The carbon budgets and sectoral emissions ceilings provide a pathway towards Ireland's 2030 and 2050 climate targets.

Gas Networks Ireland continues to monitor ongoing energy policy development and will incorporate further policy measures and ambitions into the NDP scenarios as these measures and ambitions become known. In this section, we also look beyond the 10-year network adequacy assessment timeline, to consider the role the gas network will play in decarbonising Ireland's energy system.

4.1. Policy background

Climate change is one of the greatest and most urgent global challenges, affecting communities, human health and the environment. Significant growth in population and economic activity continues to increase the demands on energy. Policy developments at National and European level continue to evolve at pace, and Ireland is committed to achieving net-zero emissions of greenhouse gases by 2050 at the latest. The necessity to ensure the pathway to decarbonisation is underpinned by affordability and security of supply has been brought into focus in recent years through the unprecedented stress events experienced on global energy markets[13]. It is broadly acknowledged that dispatchable power generation (typically powered by natural gas, and in future powered by renewable gases) will have an important role to play in underpinning security of supply throughout (and beyond) the transition of Ireland's power system to net-zero emissions. The significant role that the growth of renewable gases will play in the decarbonisation of Ireland's gas network and wider energy system is acknowledged and brought to the fore in many of the new policy developments of the last two years, as highlighted below.

Relevant National and European policy developments are summarised in Figure 4.1.

11 At the time of the data freeze for this report, the latest published PfG was dated June 2020.
12 Programme for Government https://assets.gov.ie/130911/fe93e24e-dfe0-40ff-9934-def2b44b7b52.pdf

Figure 4-1: National and European energy policy developments

National Policy Developments

Existing:

- Programme for Government (2020)
- Climate Action and Low Carbon Development Act (July 2021)
- Carbon Budgets and Sectoral Emissions Ceilings (Feb 2022/July 2022)
- National Hydrogen Strategy (July 2023)
- Energy Security in Ireland to 2030 (November 2023)
- Climate Action Plan 2024 (December 2023)
- National Biomethane Stategy (May 2024)
- Long Term Strategy on Greenhouse Gas Emissions Reductions (June 2024)
- Updated National Energy and Climate Plan (July 2024)

Upcoming:

- Renewable Heat Obligation (Expected Q4 2024)
- Large Energy Users Connection Policy (Expected 2025)
- National Hydrogen Strategy - Action Plan (Expected 2025)

European Policy Developments

Existing:

- European Green Deal (December 2019)
- EU Hydrogen Strategy (July 2020)
- EU Energy System Integration Strategy (July 2020)
- Fit for 55 Package (July 2021)
- REPowerEU (March 2022)
- Renewable Energy Directive (RED) (October 2023)
- CO_2 Emission Standards for HDVs (November 2023)
- Gas Demand Reduction Regulation (March 2024)
- Energy Performance of Buildings Directive (May 2024)
- Net Zero Industry Act (June 2024)
- EU Hydrogen and Gas Market Decarbonisation Package (July 2024)
- Methane Emissions Regulation (July 2024)

National policy
Programme for government

In 2020, the Programme for Government committed Ireland to an average 7% per annum reduction in overall greenhouse gas (GHG) emissions from 2021 to 2030, and to achieving net-zero emissions by 2050 at the latest. This 51% reduction by 2030 is more than double the 23% emission reductions targeted in the 2019 Climate Action Plan. This increase in emission reductions from 23% to 51% means that Ireland will need to consider all initiatives and technologies that would reduce emissions on a no-regrets basis.

Climate action and Low Carbon Development Act 2021

In March 2021, the Climate Action and Low Carbon Development (Amendment) Bill 2021 was published which makes the Government legally accountable for Ireland's target of net-zero emissions by 2050. The Bill amends the Climate Action and Low Carbon Development Act 2015 to significantly strengthen the framework for governance of climate action by the State in order to realise Ireland's national, EU and international climate goals and obligations. The Bill places Ireland's commitment to achieve a climate neutral economy no later than 2050 (known as the 'national climate objective') on a statutory basis. In addition, the Bill strengthens public participation and provides that, for each of the relevant plans, strategies, and carbon budgets, DECC will consult with the public. In July 2021, the Bill was signed into law, as the Climate Action and Low Carbon Development (Amendment) Act 2021.

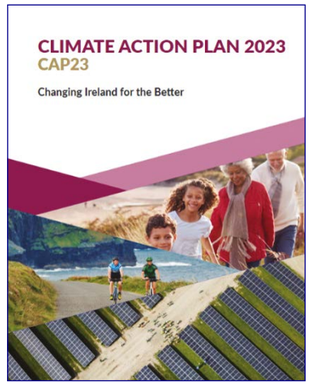
Carbon budgets

Ireland's carbon budget programme, comprising three 5-year budgets (2021-2025; 2026-2030; and 2031-2035), came into effect on 6 April 2022, representing the total amount of emissions that may be emitted during a specific period. The budgets are further broken down into sectoral emissions ceilings, which determine how each sector of the economy contributes to the achievement of the carbon budgets.

The sectoral emissions ceilings have been set for the electricity, transport, buildings, industry and agriculture sectors, with reductions in emissions ranging from 25% to 75% per sector by 2030, relative to 2018 emission levels. In addition, the agreement reached on sectoral emissions ceilings also committed increased production targets for offshore-wind, solar, green hydrogen, and biomethane to further accelerate the reduction of overall economy-wide emissions.

Climate Action Plan

In 2019, the Irish Government published their first Climate Action Plan (CAP), with the aim of tackling climate change by setting out sectoral targets, actions and timelines. In addition to setting out a pathway to 2030, it also set out clear governance arrangements which will significantly enhance accountability and purpose in implementing the proposals. In December 2022, the Government published the Climate Action Plan 2023 (CAP23), its second annual update to the Climate Action Plan. CAP23 is the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021 and following the introduction of the economy-wide carbon budgets and sectoral emissions ceilings in 2022. The plan implements the carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive actions to halve Ireland's emissions by 2030 and to reach net zero no later than 2050.



In December 2023, DECC published the Climate Action Plan 2024, an update to CAP23, refining and updating measures and actions, focusing on Sectorial Emissions Ceilings and Carbon Budgets 1&2.

Decarbonised gases such as biomethane and green hydrogen are recognised in the CAP as being a critical component for Ireland's energy ecosystem, with the suitability of these gases for use in decarbonising medium and high temperature processes being acknowledged. The following targets for renewable gases for 2030 are included:

- 0.7TWh renewable gas for residential heating
- 0.4TWh renewable gas for commercial buildings
- At least 2.1TWh of zero emission gas for industrial heating

Furthermore, CAP 2024 calls out zero-emission gas-fired generation from biomethane and hydrogen commencing by 2030, highlighting the role renewable gases can play in the electricity sector.

To facilitate investment, the Plan proposes to bring forward policies and regulatory frameworks to stimulate domestic biomethane production and use, and to develop a sizeable hydrogen sector.

Ireland's National Hydrogen Strategy

Gas Networks Ireland has strongly welcomed the publication of the Government's National Hydrogen Strategy in July 2023. The report is of particular relevance for Gas Networks Ireland as it outlines the future role green hydrogen and the gas network will play in specific areas of Ireland's energy system, enabling the decarbonisation of hard to abate sectors such as transport, industrial heating and power generation.

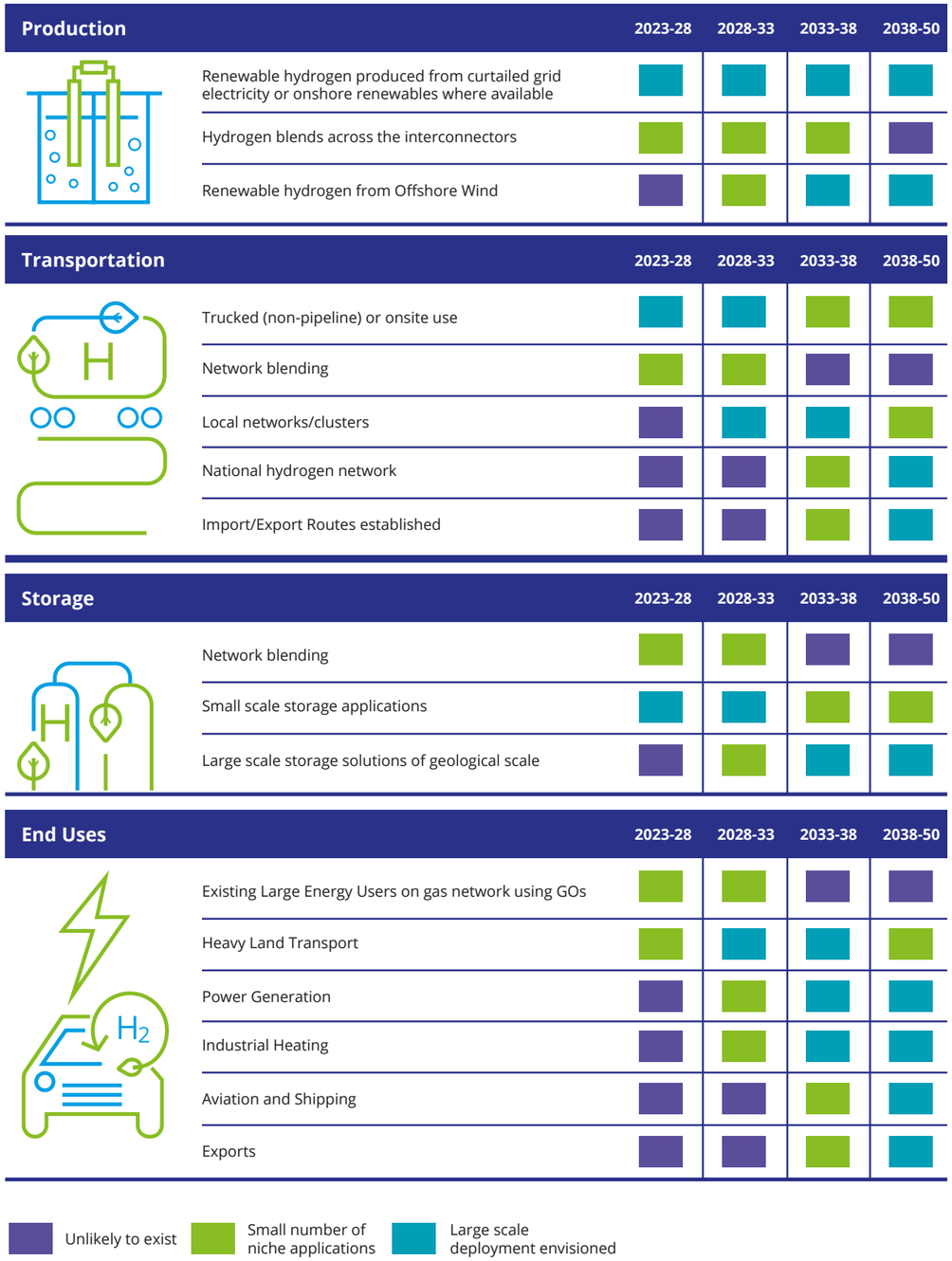
The strategy recognises that hydrogen offers an incredible opportunity to enable Ireland to transition to a climate neutral economy by being a zero-carbon substitute for fossil fuels. In doing so, green hydrogen will help Ireland meet its 2050 net-zero emissions targets, diversify and strengthen its security of supply, provide a pathway to energy independence, and in the long-term, potentially leading to the creation a new energy export market.

The gas network will play a leading role in hydrogen transportation and will also be a key enabler in the development of a hydrogen economy across all the components of the hydrogen value chain.

As members of the Interdepartmental Hydrogen Working Group, Gas Networks Ireland are helping to develop an implementation plan to deliver the strategy's actions. The plan should look to identify where the network can be repurposed, or where new pipelines may be required and provide detailed costings and a programme of works.

13 Energy Security In Ireland to 2030

Figure 4.2: Ireland's strategic hydrogen development timeline



Security of energy supply

The Government's Energy Security Package was published in November 2023. This Package includes the overarching report Energy Security in Ireland to 2030[14], which outlines a new strategy to ensure energy security in Ireland for this decade, while ensuring a sustainable transition to a carbon neutral energy system by 2050. The report is informed by the Government's energy security policy objectives, to ensure energy is affordable, sustainable, and secure, and the review considered the risks to oil, natural gas, and electricity.

The package also includes the report Securing Ireland's Gas Supplies[15], which assesses the potential risks to Ireland's natural gas security of supply, to review policy options that may enhance Ireland's security of gas supply and to present recommendations to the Minister and Government based on the policy proposals presented. The report includes 'enduring measures' that will provide solutions based on Ireland's long-term future requirements, including renewable compatible large scale gas storage, increased production of renewable gas and a fit-for-purpose gas network that evolves with changing gas requirements.

The report also includes a 'transitional measure' to address any unmet demand should a significant disruption occur to Ireland's largest gas infrastructure in the medium-term. Based on a preliminary analysis, DECC has identified a floating Strategic Gas Emergency Reserve for use in the event of a disruption as an appropriate measure to address the identified risks to our gas security of supply.

In recognition of the risk associated with a lack of adequate resilience in case of a major disruption to Ireland's gas imports, the Government have tasked Gas Networks Ireland, under Action 17 in the Package, with undertaking a detailed examination of the optimal approach to delivering a strategic gas emergency reserve. Gas Networks Ireland submitted a preliminary proposal to DECC in Q2 2024 and are continuing to progress detailed design and procurement work on a 'no regret' basis in order to minimise the impact to the delivery schedule whilst the matter awaits Cabinet consideration.

Two particular actions called out in the Package related to Gas Networks Ireland's network planning, and which we are actively progressing, are as follows:

- Action 16: To ensure a fit-for-purpose gas grid, that supports Ireland's energy and climate ambition
- Action 22: To integrate the forecasting framework for the electricity and gas sectors

Gas Networks Ireland are actively engaging with DECC to scope the deliverable for Action 16 in 2025. Separately, as part of the new Price Control 5 Flexibility and Adaptability Incentive , Gas Networks Ireland are responsible for delivering the new biennial Core Flexibility Report (CFR), the first of which will be published for public consultation in 2025. The aim of the CFR is to determine and support long-term adaptive planning, usage and investment requirements for the gas network for the next 10-15 years. There is an opportunity to leverage the work being carried out on the CFR, to inform Action 16 of the Energy Security Package and Action 12 of the National Hydrogen Strategy, and to align and streamline the outputs where appropriate, This opportunity is currently under discussion with DECC.

With a timeline for delivery of 2027, Action 22 sits specifically within the scope of future NDPs. Gas Networks Ireland are actively engaging with the electricity TSO, EirGrid, and with DECC in this regard to establish the scope for an integrated forecasting methodology. Progress has been made in this area in 2024, specifically in identifying the existing alignment between the two TSOs regarding forecasting inputs and methodologies, and this work will continue into 2025.

National biomethane strategy

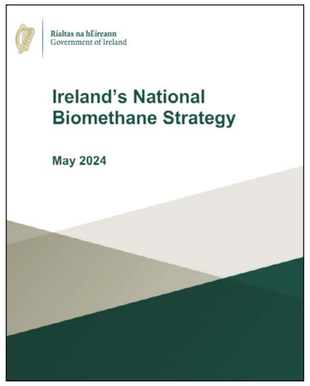
On the 28th of May 2024, the Minister for the Environment, Climate and Communications, Eamon Ryan and the Minister for Agriculture, Food and the Marine, Charlie McConalogue announced the publication of Ireland's National Biomethane Strategy. The strategy is seen as a first step to deliver on Ireland's ambitious biomethane production target of 5.7 TWh per annum by 2030 and to develop a biomethane industry of scale. The strategy recognises that without biomethane, Ireland is unlikely to meet its legally binding climate target.

The ambition of the National Biomethane Strategy is to provide an alternative energy vector and decarbonisation pathway for a variety of Ireland's most difficult to decarbonise sectors. The strategy also recognises biomethane injection into the national gas network as being crucial to the successful development of a biomethane sector in Ireland and transporting

14 Energy Security in Ireland to 2030
15 Securing Ireland's Gas Supplies

biomethane via gas pipeline is the most efficient, sustainable, and cost-effective method of transporting to end users.

Key components of the strategy include the development of infrastructure for biomethane injection into the gas grid, incentivising farmers and other stakeholders to participate in biomethane production and aligning with EU regulations and funding opportunities. The Irish government also plans to establish a certification scheme to ensure the sustainability and traceability of biomethane that is not transported through the gas grid.



A number of further actions were identified within the National Biomethane Strategy which require Gas Networks Ireland to consider additional facets of the policy including:

- Engage with the regulator on plans for procuring biomethane for shrinkage gas (own use gas)
- Participate in a newly established Biomethane Implementation Group to develop and deliver a strategy Implementation Plan under the auspices of the Heat and Built Environment Taskforce
- Engage with the regulator to review and finalise the biomethane grid connection policy and economic test including the need for financial bonds and costs for grid connections
- Participate in the development of an online Information Hub to provide Anaerobic Digestion (AD) project development assistance including information on technical, environmental, and financial advisory supports available
- Participate in the establishment of a governance structure to support the strategy delivery including identification of appropriate KPIs, and target monitoring and reporting processes

The strategy supports Ireland's commitment to a low-carbon economy by enhancing energy security, supporting rural development, and contributing to the reduction of greenhouse gas emissions. As part of the broader Gas Networks Ireland (GNI) initiative, the Irish National Biomethane Strategy plays a critical role in shaping the future of the gas network, ensuring it aligns with Ireland's climate objectives.

The Renewable Heat Obligation scheme, expected to be implemented in 2025, and an initial €40 million Biomethane Capital Grant Scheme are welcome as the first steps in supporting biomethane market development in Ireland.

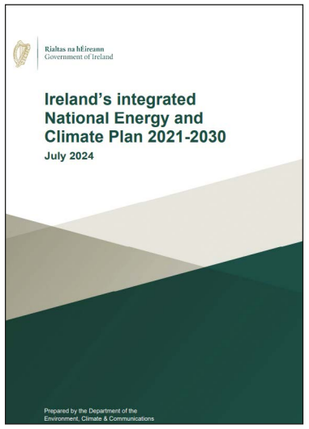
Long-term strategy on greenhouse gas emissions reductions

Submitted to the EU Commission and the United Nations Framework Convention on Climate Change (UNFCCC) in June 2024, Ireland's current Long-term Strategy on Greenhouse Gas Emissions Reduction sets out indicative pathways, beyond 2030, towards achieving carbon neutrality for Ireland by 2050, and serves as a bridge between shorter-term Climate Action Plans and Carbon Budgets and the longer-term goals of the European Climate Law and Ireland's National Climate Objective. This Strategy is an update to the one prepared in 2023, and the first to be prepared under Ireland's Climate Action and Low Carbon Development Acts 2015 to 2021. The Strategy is consistent with Ireland's National Energy and Climate Plan.

The Strategy recognizes the importance and requirement for the production and usage of zero-emission gases to deliver a carbon neutrality by 2050 and promotes the production of green hydrogen using renewable energy sources. This is seen as a crucial step in decarbonizing sectors that are hard-to-abate, such as heavy industry and long-haul transport. The strategy outlines the need to adapt existing gas infrastructure to support the integration of renewable gases.

Updated national energy and climate plan 2021 - 2030

In 2019, the Department of the Environment, Climate and Communications (DECC) submitted Ireland's National Energy and Climate Plan (NECP) for 2021 – 2030 to the European Commission (EC). NECPs determine each EU Member States contribution towards the EUs climate targets. Each NECP covers a 10-year period and provides a framework for planning national climate and energy objectives, targets, and policies. Ireland, along with all member states were required to submit an updated NECP to the EC in June 2024, which incorporated recommendations from the EC, responses to public consultations, and any updated policies and targets.



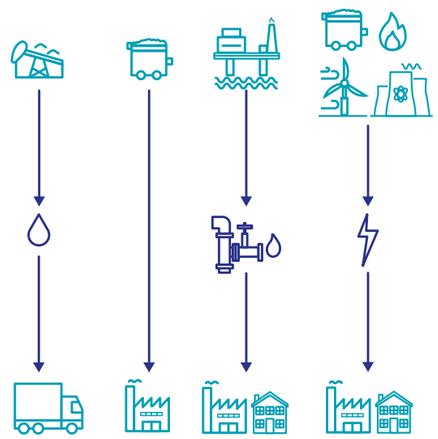
The updated Plan highlights the decarbonisation opportunities that green hydrogen, biomethane, district heating, and CNG can bring, referencing the National Hydrogen Strategy, National Biomethane Strategy, and the Energy Security in Ireland to 2030 report. The Plan expects hydrogen demand to grow significantly post-2030 and is expected to play an important role as a source of dispatchable, flexible electricity, for storage of renewable energy, and in decarbonising hard to abate industrial processes. The Energy Security in Ireland to 2030 report pledges to complete a Network Transition Plan for the gas network to support long-term planning, future uses, and investment needs in line with our Sectorial Emission Ceilings.

The National Biomethane Strategy target of up to 5.7 TWh of indigenously produced biomethane by 2030 is included, with the Renewable Heat Obligation seen as a key support to deliver on this ambition. It highlights the need for Ireland to learn from the experience of other member states including Denmark if it is to become a leader in biomethane production.

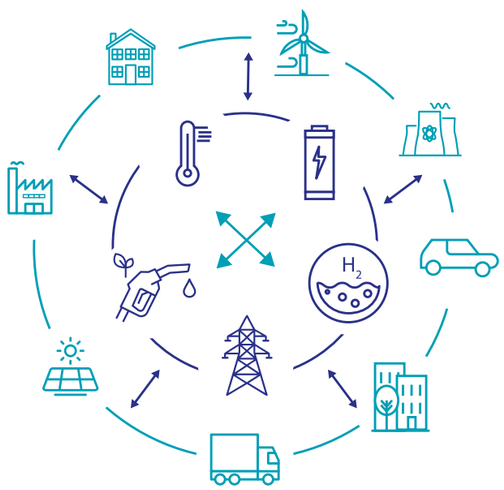
The European green deal

The European Green Deal, published in December 2019, outlines a strategic roadmap to achieve climate neutrality by 2050. It encompasses a wide range of policies and measures aimed at reducing greenhouse gas emissions, promoting sustainable economic growth, and ensuring that the transition to a green economy is inclusive and equitable. The EU Green Deal has been put into action through various sector-specific initiatives which aim to deliver climate neutrality by 2050.

The energy system today:
linear and wasteful flows of energy, in one direction only



Future EU integrated energy system:
energy flows between users and producers, reducing wasted resources and money



EU energy system integration strategy (July 2020)

The EU Energy System Integration Strategy, launched in July 2020, is a key component of the European Green Deal. It aims to create a more integrated and efficient energy system to help achieve the EU's climate neutrality goals by 2050.

Better integration will allow for the optimisation of the energy system as a whole, across multiple energy carriers (electricity, heat, coal, gas, solid and liquid fuels), infrastructures and consumption sectors. It includes a stronger focus on the electrification of demand (e.g. through electric vehicles, heat pumps and industrial processes), flexibility and storage, hydrogen and heating and cooling, which represents half of the EU's energy use.

EU hydrogen strategy (July 2020)

The EU Hydrogen Strategy was published by the EU Commission in July 2020 (COM/2020/301) and it sets out policy action points in the following five areas:

- Investment support – Through the European Clean Hydrogen Alliance, the EU has developed an investment agenda to stimulate hydrogen production use
- Support production and demand – Proposes measures to facilitate hydrogen use
- Creating a hydrogen market and infrastructure – The strategy includes planning for hydrogen infrastructure such as refuelling stations
- Research and co-operation – The EU supports research and innovation to develop new hydrogen technologies
- International co-operation – This strategy emphasizes co-operation with international partners to develop a global hydrogen market

Fit for 55 package (July 2021)

In July 2021, the European Commission adopted the 'Fit for 55 Package' – a set of legislative proposals to ensure the EU reaches its updated 55% emissions reduction target for 2030 (compared to 1990 levels). This package is seen as a key next step in delivering the Green Deal and in putting Europe on the path to becoming the world's first net-zero continent by 2050. It includes EU level strategies on hydrogen and energy system integration which directly impact gas network development.

REPowerEU (May 2022)

The REPowerEU plan outlines the EU's path to energy independence from Russian fossil fuel by 2027 and plans to fast forward the green transition. The plan puts forward short, mid and long-term targets and measures, including demand reduction, diversification of suppliers, and acceleration of the transition to renewable energy sources. The Plan also includes a goal to increase biomethane production to 35bcm, across the EU, by 2030, as well as a target of producing 10 million tonnes of domestic and 10 million tonnes of imported renewable hydrogen by 2030.

Recast energy efficiency directive (September 2023)

The recast Energy Efficiency Directive (EU) 2023/1791[16] was published in the EU Official Journal in September 2023, taking effect on the 3rd October 2023. EU Member States have two years to transpose this Directive into National law.

The Directive establishes an EU energy efficiency target of 11.7% for 2030. It requires EU Member States to collectively ensure an additional reduction of final and primary energy consumption, compared with energy consumption forecasts made in 2020. EU countries will be required to achieve new savings of 1.3% of final energy consumption p.a. to 2025, rising to 1.5% p.a. to 2027, and increasing further to 1.9% p.a. to 2030 and beyond. This is up from the current target of 0.8% p.a.

Renewable energy directive (RED) III (October 2023)

The Renewable Energy Directive III (RED III) was published in the OJEU on 31st October 2023. This directive is part of the EU's "Fit for 55" package, aiming to increase the share of renewables in the EU's overall energy consumption to 42.5% by 2030, with an additional indicative target of 2.5%. The Directive includes a 1.6% annual increase in renewable energy usage for industry, with specific targets for hydrogen usage. It also requires that Member States must achieve either a 29% share of renewables in transport or a 14.5% reduction in greenhouse gas intensity by 2030 in the transport sector and an indicative target of at least 49% renewable energy in buildings by 2030.

Carbon border adjustment mechanism (October 2023)

The Carbon Border Adjustment Mechanism (CBAM) has been designed to account for the carbon cost of the import of carbon intensive goods into the EU, such as iron and steel, aluminium, cement, fertilisers and electricity. The Mechanism is due to take effect in January 2026, following a 2-year implementation phase where impacted importers are required to adopt new reporting obligations (2024) and complete the registration requirements (2025).

From 2026, importers will be required to purchase CBAM certificates to cover the embedded carbon emissions in affected goods. The cost of these certificates will be based on the weekly average EU Emissions Trading Scheme (ETS) auction price but with deductions made for any carbon tax paid in the exporting country.

The implication of this mechanism for the Irish electricity sector is that electricity imports from GB from 2026 onwards will include the full cost of the EU ETS where applicable, i.e. if the imported electricity incurs a carbon cost. Limited exemptions for electricity imports exist and it remains to be seen if these will be applicable for Irish electricity imports from GB.

CO_2 emission standards for heavy duty vehicles (HDVs) (November 2023)

In November 2023, the EU enacted legislation to expand the scope of current Heavy Duty Vehicles (HDV) regulations to include urban buses, coaches, trailers and other types of lorries. The regulation sets targets for CO_2 emissions of HDVs to fall by 45% by 2030 compared to 2019 levels and applies from 1 July 2024.

Energy performance of buildings directive (EPBD) (May 2024)

The EPBD was published in the OJEU on 8th May 2024 and entered into force on 28th May 2024. Member states have two years from the entry into force to transpose this directive into national law. The revised Directive will make 'zero-emissions' the standard for new buildings. All new residential and non-residential buildings must have zero on-site emissions from fossil fuels, as of 1st January 2028 for publicly owned buildings and as of 1st January 2030 for all other new buildings, with a possibility for specific exemptions. The Directive contains new provisions to progressively phase-out fossil fuels from heating in buildings and boost the deployment of solar power installations, taking into account national circumstances. Member States will also have to ensure that new buildings are 'solar ready'. Subsidies for the installation of stand-alone boilers powered by fossil fuels will not be allowed as of 1st January 2025.

Net-zero industry act (NZIA) (June 2024)

This Regulation was published in OJEU on 28th June 2024 and entered into force the following day and defines a series of net zero technologies. It is deemed to be a crucial part of the EU's broader Green Deal Industrial Plan, designed to strengthen the EU's capacity to reach its climate goals by 2050 through various measures supporting clean technologies and reducing carbon emissions.

EU hydrogen and gas market decarbonisation package (July 2024)

The 'Hydrogen and gas market decarbonisation package', the fourth iteration of comprehensive legislation after the 'Third Energy Package of 2009',was published in the OJEU on 15th July 2024 and entered into force on 4th August 2024, with the regulation due to take effect from 5th February 2025. Member states have two years (until 5th August 2026) to transpose the Directive. It enables the decarbonisation of gas consumption and sets out policy measures to support the creation of effective infrastructure to enable future hydrogen markets by removing barriers and establishing EU-wide rules. This includes the development of a dedicated hydrogen infrastructure and the repurposing of some existing natural gas infrastructure for hydrogen.

Methane emissions regulation (July 2024)

The Methane Emissions Regulation ((EU) 2024/1787) was published in the OJEU on 15th July 2024 and the regulation entered into force on the 4th August. This Regulation is the world's first to regulate methane emissions from imports and establishes a new EU legal framework for the measurement, reporting, and verification of methane emissions in the energy sector. It introduces mitigation measures to prevent such emissions, including detecting and repairing methane leaks and limiting venting and flaring.

The Regulation also sets out global monitoring tools to ensure transparency on methane emissions from imports of oil, gas and coal into the EU. The main requirements for a gas system operator under this Regulation will be:

- avoidable venting of natural gas is to be prohibited;
- mandated minimum leak detection surveys of the network and GNI installations (LDAR);
- report annually on methane emissions from the entire network; and
- mandated minimum time for leak repairs.

16 Directive (EU) 2023/... of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (europa.eu)

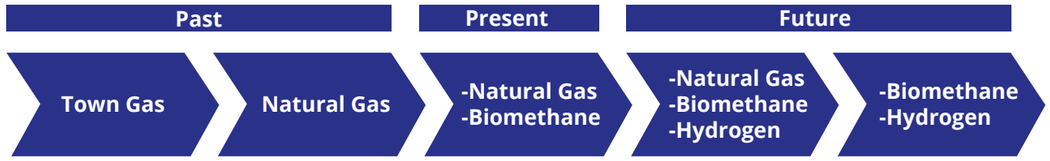
Gas Networks Ireland already have systems and processes in place to minimise operational venting, leak survey the network and report on emissions. A detailed review is in progress and enhancements will be made where necessary to meet the requirements of the regulations.

4.2. Decarbonising Ireland's gas network

Gas Networks Ireland is committed to decarbonising the gas network by 2045. To this end, in June 2024, Gas Networks Ireland published its ambitious Pathway to a Net Zero Carbon Network[17] which highlights the essential role the national gas network will play in transitioning Ireland to a carbon-neutral economy by 2050 and towards Ireland's climate targets. By focusing on transporting renewable gases like biomethane and green hydrogen, the plan aims to ensure a secure and reliable energy supply while reducing greenhouse gas emissions.

The goal is to have a fully decarbonised gas network by 2045, aligning with the broader objective of a carbon-neutral economy by 2050. This transformation will also contribute to a more integrated and sustainable energy system. The actual basis and timing for the full decarbonisation of our network will become clearer as energy policy and new energy sources and technologies progress, but we know that by embracing innovation in these areas, leveraging our expertise, and collaborating with stakeholders, we can realise this ambition. The gas network infrastructure is not inherently a fossil fuel network; it is already transporting biomethane in small but growing volumes and it can be adapted and repurposed to transport hydrogen. The network has a history of evolution previously transitioning from town gas to natural gas. This means Ireland can continue to benefit from the reliability of the gas network in a low carbon future.

Figure 4-3: Gas infrastructure adapting to multiple energy carriers



By 2045, the gas network can be fully decarbonised through the injection and transportation of biomethane and hydrogen. Integrating the gas and electricity networks will enable this transition to take place efficiently. For example, an integrated energy system would enable the production, transportation and storage of green hydrogen, contributing towards Ireland's objective of a net-zero emissions energy sector by 2050, in line with both European and National policy, as set out above in section 4.1.

A net-zero carbon gas network supports increased decarbonisation across electricity generation, industry, heating and transport and can play a role in achieving negative emissions which experts agree are required to achieve net-zero. The guiding principles for transportation of renewable gases and for sector coupling are set out below, followed by a high-level overview of the key enabling technologies, as introduced in the preceding paragraphs.

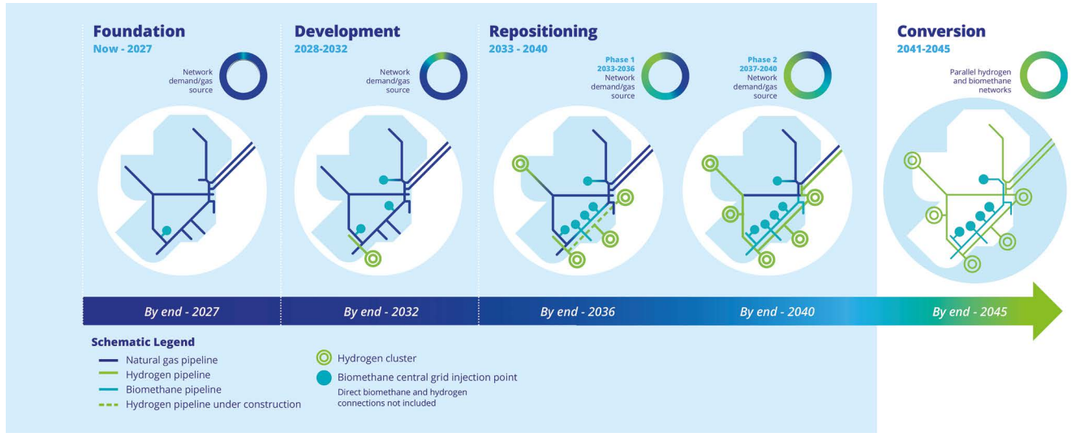
Principles for transportation of renewable gases

Gas Networks Ireland is the proud owner and operator of one of the most modern gas networks in Europe. However, we recognise that our network must be repurposed to transport renewable gases. Our organisation and its network are uniquely placed to deliver the necessary changes. This will also require collaboration with other energy partners to collectively ensure Ireland's goal of a net zero carbon energy system by 2050 is met.

Gas Networks Ireland has developed a series of future scenarios which consider the importance and impact of policy decisions on the scale of decarbonisation that can be achieved. Through these scenarios we demonstrate how the gas network supports decarbonisation for domestic customers, industrial users, transport, agriculture and power generation.

As National and European energy policy evolves, Gas Networks Ireland is continuously reviewing and developing potential pathways to achieve a decarbonised gas network by 2045. It is likely that both the development of blended (i.e. methane blended with hydrogen) and dedicated or repurposed pipelines (on 100% Hydrogen or biomethane) will play a role in decarbonising the gas network and the wider energy system. Figure 4.4 shows the potential composition of gas within the gas network as we move towards a fully decarbonised network.

A Pathway to Decarbonisation



The natural gas network as it exists today consists of a Methane Backbone, with small volumes of biomethane blended. In the short to medium-term, the level of biomethane blending will increase substantially. In the medium to long-term, blending of natural gas and biomethane with hydrogen will enable initial volumes of hydrogen to be utilised, contributing to a gradual decarbonisation of the gas mix. In the long-term, a dedicated Hydrogen Backbone can be developed, through the re-purposing of existing pipelines and/or construction of new pipelines.

In addition to delivering a decarbonised gas network, the above components will serve to further enhance Ireland's security of supply position, through the introduction of an additional energy supply carrier (hydrogen) to Ireland's energy mix, and by enabling the bulk transport of indigenously produced renewable gases (biomethane and hydrogen).

Principles for sector coupling

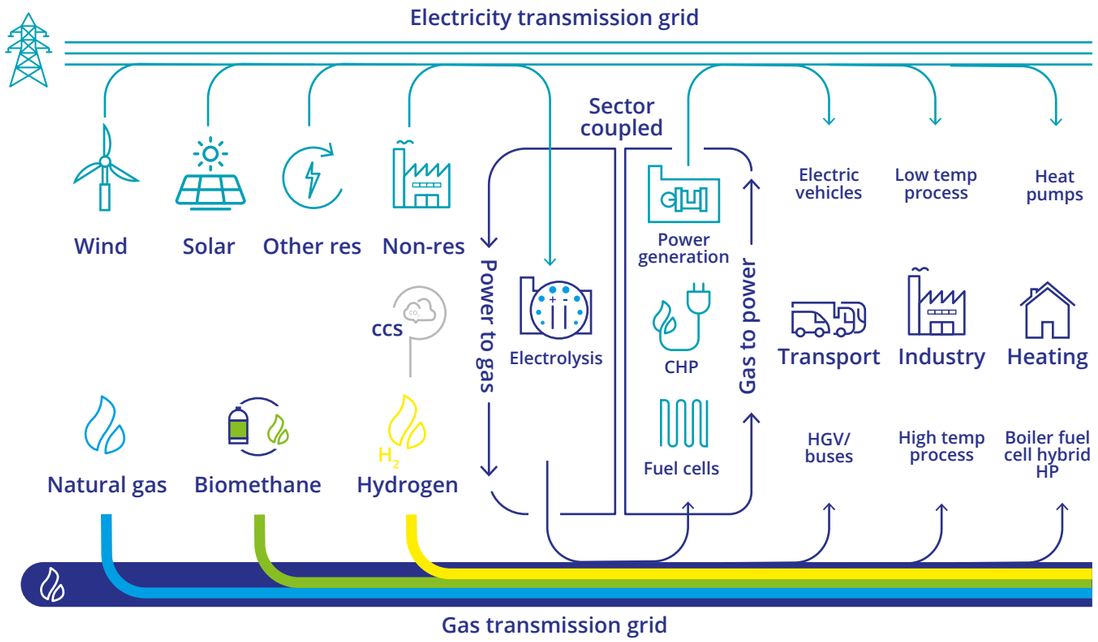
The European Commission launched its 'Strategy for Energy System Integration' on the 8th of July 2020. This is one of the most ambitious and all-encompassing elements of the European Green Deal, providing the basis for "the coordinated planning and operation of the energy system as a whole, across multiple energy carriers, infrastructures, and consumption sectors". It envisages an integrated energy system which delivers decarbonisation "at the least cost across sectors while promoting growth and technological innovation". One of the key interfaces in an integrated system will be between gas and electricity grids. By leveraging the bulk storage capability of gas infrastructure, and utilising innovative technologies such as Power-to-Gas and hydrogen networks, a decarbonised and secure energy system can be achieved.

Gas Networks Ireland welcomes the policy requirement for greater energy system scenario planning integration as set out in the National Hydrogen Strategy and in the Energy Security in Ireland to 2030 report. In order to strengthen Gas Networks Ireland's and EirGrid's annual forecasting processes, the Energy Security in Ireland report identifies the need to be informed by a joint scenarios framework that appropriately reflects integration between energy sectors. The report also acknowledges the significant interdependencies between the gas and electricity networks, and that these interdependencies will become more important with the increasing penetration of both renewables and renewable gases in the energy system. While Gas Networks Ireland, in the formation of the inputs and assumptions to this NDP, actively engage with the Irish electricity TSO, EirGrid, and align well with their draft National Resource Adequacy Assessment (NRAA), we welcome the direction by the Energy Security Package to produce joint scenarios in future and are proactively engaging with EirGrid in this context as outlined above in section 4.1.

Figure 4-5 illustrates the principles of a coupled energy system. Such a system can address the challenges that cannot be overcome through electrification alone. These include serving the energy needs of high-temperature industrial processes, heavy goods transport, as well as converting surplus renewable generation to green hydrogen (through electrolysis) and storing this gas within the wider gas network.

Cross-vector integration between electricity, gas and heat can serve as an additional source of energy system flexibility and security of supply.

Figure 4-5: Principles for sector coupling

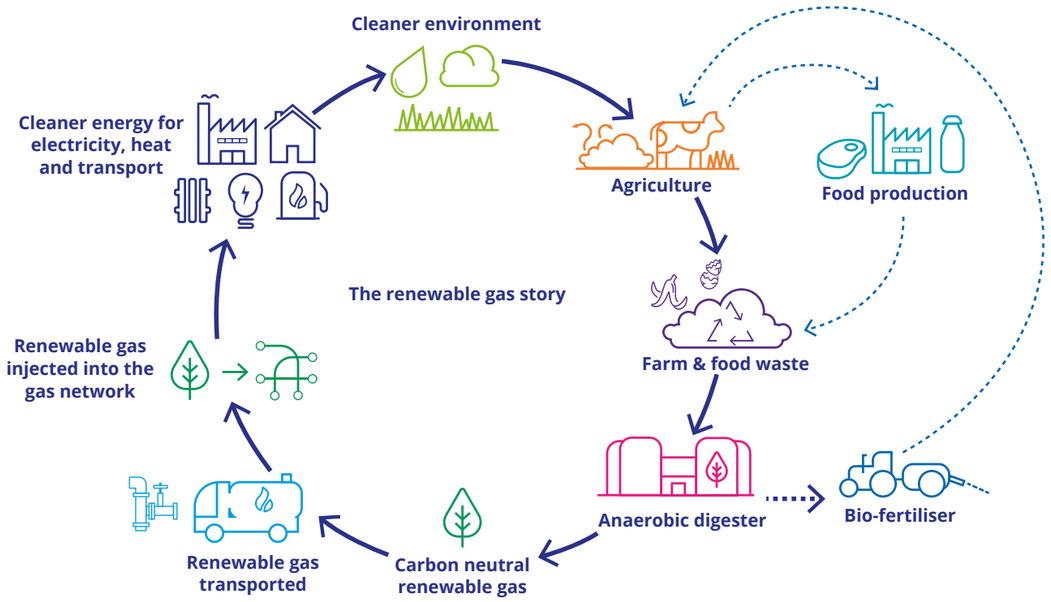


4.3. Key enabling technologies

While there are various pathways to delivering a net-zero gas network by 2045, there are a number of key technologies, common to each pathway, which will enable this transition to a lesser or greater extent. Biomethane is already integrated into our network, and its supply is delivering reduced emissions in the transport sector, through the provision of bioCNG, and in the heating sector. Achieving a net-zero gas network will require significant growth in the supply of biomethane and will also require development of and investment in hydrogen at scale (as referred to in the National Hydrogen Strategy). In addition, Gas Networks Ireland notes the key metrics included on the deployment of carbon abatement technologies, e.g. carbon capture, utilisation and storage (CCUS), within the Industrial sector in particular, in the CAP 2024.

This section considers each of these technologies, in the context of enabling a pathway to achieve a net-zero gas network by 2045.

Figure 4-6: Renewable gas story



Biomethane

The Irish Government has a stated ambition of 5.7TWh of biomethane production by 2030, enough to supply approx. 10% of Ireland's current annual gas demand. Biomethane is a renewable gas, structurally identical to natural gas that can be used as a direct substitute. Biomethane is fully compatible with both the national gas network and end-use technologies such as existing appliances, industrial infrastructure and vehicles and can seamlessly replace natural gas to reduce emissions in industry, transport and power generation. As such, it is a means of reducing the consumption of fossil fuels and, thereby, contribute to the transition towards a net-zero energy system.

Delivering on Ireland's increased ambition for biomethane production to 5.7TWh by 2030, as set out in the National Biomethane Strategy, is one of Gas Networks Ireland's key priorities. In 2023, a connection agreement was signed by Gas Networks Ireland providing for the first direct biomethane plant connection to the network, with a further five new connection offers being issued by the end of the year, signalling a genuine start to the Irish biomethane industry.

Sustainable and indigenously produced biomethane can contribute towards Ireland's 2030 emissions reduction target and sectoral emissions ceilings, while also playing a role in sustainably delivering a net-zero energy system by 2050. Biomethane production also serves to diversify and strengthen security of energy supply, providing a pathway to energy independence.

Delivering on Ireland's increased ambition for biomethane production to 5.7TWh by 2030, as set out in the National Biomethane Strategy, is one of Gas Networks Ireland's key priorities.

Some of the key benefits of Biomethane as a fuel source include:

- Enhancement of security of supply as the biomethane is domestically produced, dispersed throughout the country, and can, as production at Corrib continues to decline, replace the fossil gas previously produced from that gas field.
- Biomethane can be produced and transported using existing technology, and the existing gas network.
- Biomethane can offset emissions in hard to abate energy demand sectors, such as intensive heat industries and transport.
- Biomethane supports employment in rural areas, promotes circular economy in agriculture, and can improve soil health. Digestate, a biproduct of biomethane production, can displace fossil fuel-produced fertilizer, providing further emissions savings.

Similar to the early years of the wind industry, the biomethane gate price is currently more expensive

than natural gas. However, when the full system decarbonisation alternatives are considered, biomethane represents a cost competitive solution.

The injection of biomethane into the gas network is aligned with both EU and individual Member State decarbonisation strategies across Europe. Several EU Member States are incentivising a move away from the use of biogas at AD sites for electricity production towards the injection of biomethane into the gas network. In Denmark, while previously the major share of biogas was used for electricity production, today approx. 80% is upgraded to biomethane and injected into the gas network[18]. Italy has introduced incentives for existing AD plants to direct their biogas to be upgraded to biomethane production and subsequent injection into the gas grid. Other countries, such as the United Kingdom and France, have also developed policies to similarly target increasing the deployment of biomethane production for injection into the gas network. An alliance has been established amongst the French gas network companies to promote the decarbonisation of the gas network, with a 10% renewable gas target for 2030, rising to an 100% target for 2050. Denmark has committed to fully displacing natural gas on their gas distribution network with biomethane by 2035; in 2023 the share of biomethane in the Danish gas system reached approx. 40%.

The European Commission has identified Ireland as having the greatest potential per capita to deploy biomethane[19]. In September 2023, Gas Networks Ireland published the Biomethane Energy Report[20] which outlines the current and future role biomethane and the gas network will play in specific areas of Ireland's energy system, and the opportunity it provides to decarbonise sectors including agriculture, transport, industrial heating and power generation.

The report confirms that there is significant interest and potential for biomethane production. A total of 176 prospective biomethane producers responded to a request for information preceding this report, outlining Ireland's potential for a 14.8TWh per annum biomethane industry. The report also highlights that most of the biomethane can be economically connected to the low-pressure distribution system with a few exceptional connections mainly driven by their proximity to existing transmission networks. Furthermore, those production plants which are either smaller in size or are too distant from the existing network may be facilitated by transportation by road and injection via central grid injection facilities.

In preparation for the growth of the biomethane industry, Gas Networks Ireland has developed a connection policy specifically to allow biomethane producers to directly connect to the gas network, which has been approved by the CRU, and is also developing an additional connection policy for Centralised Grid Injection points to support the development of remote cluster biomethane production facilities. Gas Networks Ireland has established a Certification scheme for tracking renewable gas on the system and is currently developing a standard design for the connection of future biomethane plants to the gas network. Gas Networks Ireland is also progressing the development of the regulatory and commercial arrangements for Central Grid Injection facilities and seeking to deliver arrangements for the procurement of Biomethane as part of the Shrinkage gas portfolio. GNI is engaging with key industry stakeholders on these matters and any changes to the regulatory framework will need to be reviewed and approved by the CRU.

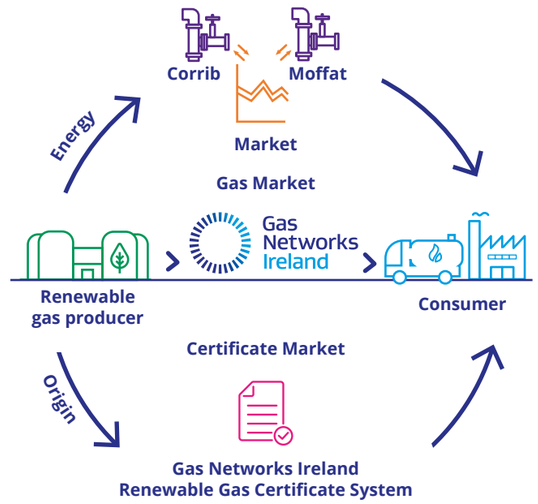
To date, four connection agreements have been signed with biomethane suppliers, with a further nine connection offers issued, signalling a genuine start to the Irish biomethane industry. The first biomethane injection facility at Cush, Co. Kildare was commissioned in 2020; 60GWh of biomethane entered the network at this supply point during 2023. In October 2024, construction of the Mitchelstown central grid injection (CGI) facility officially began. When operating at full capacity, the Mitchelstown CGI will have the potential to inject up to 700 GWh of renewable gas into the gas network annually, reducing emissions by c. 130,000 tCO2 p.a.

Over the NDP period, GNI will work collaboratively with industry stakeholders, researchers and relevant Government Departments to develop the roadmap for renewable gas and partake and contribute to the implementation of biomethane actions in the Climate Action Plan.

Guarantees of origin

Gas Networks Ireland established a Renewable Gas Registry in 2019 which issues 'Certificates of Origin' to producers injecting renewable gas into the gas grid. Statutory Instrument 350 of 2020 appointed Gas Networks Ireland as the Issuing Body for Guarantees of Origin in Ireland, as described in Article 19 of the re-cast EU Renewable Energy Directive (RED II). Producers of Renewable Gas are required to hold a certificate of sustainability issued by an EU Voluntary Scheme to ensure sustainability criteria set out under RED II are met. This assurance is vital to providing confidence to consumers that the gas delivered is renewable and can be counted towards emission reduction targets. It also gives government and regulators certainty that sales of renewable gas are recorded in a transparent manner. The Renewable Gas Registry is now recognised and relied upon by both the National Oil reserve Agency (NORA) and the Environmental Protection Agency (EPA) for tracking deliveries of Renewable Gas to refilling stations and Emission Trading Scheme (ETS) consumers.

Figure 4-7: Renewable gas certification system



Green Gas Generation, which operates the biomethane injection facility at Cush, Co. Kildare, was awarded Sustainable Certification by the International Sustainability and Carbon Certification (ISCC) for biomethane production, which certifies it as renewable gas. Glenmore Generation, who produce biomethane in Donegal, also inject at Cush and have also been certified by ISCC. ISCC-certified renewable gas is compliant with the Renewable Transport Fuel Obligation Scheme in both Ireland and the UK and is treated as a zero-emissions fuel under the EU ETS. In addition, the GRAZE (Green Renewable Agricultural Zero Emissions) Gas Project is led by Gas Networks Ireland and is supported by more than €8.4m in funding from the DECC Climate Action Fund (CAF), as part of the Government's National Energy Security Framework. Key elements of the GRAZE Gas Project include:

I. Central Grid Injection (CGI) point near Mitchelstown in Co. Cork
II. Transportation of Renewable Gas from Anaerobic Digestors to CGI
III. 2x Compressed Natural Gas (CNG) Refuelling Stations
IV. Vehicle funding for 74 CNG trucks

The EU's Farm to Fork Strategy highlights biomethane as a key element in decarbonising agriculture, which is a particularly important focus for Ireland. Additionally, it offers an immediate decarbonisation solution for transport, industry, heating and power generation, and the ability for businesses to power their operations via renewable gas made from their own waste in a truly sustainable circular economy.

Hydrogen

Hydrogen is considered an attractive option to decarbonise energy systems and can play a significant role in driving a cleaner energy future for Ireland, while also promoting indigenous security of supply and energy diversity. Hydrogen is a gas that can be produced in various ways, including from renewable electricity. In this way, hydrogen demonstrates how greater integration between Ireland's gas and electricity networks can support a low-carbon economy and reduce the potential for curtailing surplus renewable electricity. Hydrogen can be stored until needed and produces zero CO_2 emissions when combusted. It can also be blended with natural gas or used in its pure form.

At a national level, there is increasingly positive sentiment towards hydrogen's role in the net-zero solution. Ireland's National Hydrogen Strategy was published by the Government in July 2023 and has been strongly welcomed by Gas Networks Ireland. In CAP 2024, the Government recognises that green hydrogen will play a significant role in sector coupling and minimising overall costs of decarbonisation across all sectors. It also recognises that policies are potentially required to promote the use of zero carbon gases, such as hydrogen, and to support the development of inter seasonal storage of hydrogen.

At a European level, the key role of hydrogen in decarbonising our energy system is widely recognised. The EU's Hydrogen and Gas Markets Decarbonisation Package aims to facilitate access of renewable and low-carbon gases to existing gas networks. The EU's REPowerEU Plan further underlines the momentum for hydrogen to diversify and decarbonise energy supply by quadrupling the previous hydrogen supply target from c. 5 to 20 million tonnes by 2030.

Over recent years, along with 30 other European Gas Transmission System Operators, Gas Networks Ireland

18 Biogas in Denmark | The Danish Energy Agency
19 ce_delft_3g84_biogas_beyond_2020_final_report_0.pdf (europa.eu)
20 biomethane-energy-report.pdf (gasnetworks.ie)

has contributed to the European Hydrogen Backbone Initiative. By 2040, there could be almost 53,000km of 100% hydrogen pipelines throughout Europe, with the majority being re-purposed pipelines. These pipelines present a cost-effective way of transporting hydrogen to enable achievement of REPowerEU targets and enable a hydrogen economy at scale. Repurposing existing gas pipelines to transport 100% hydrogen has been found to incur a fraction of the cost (c. 10-35%) of a new hydrogen pipeline[21].

Internationally, hydrogen is currently primarily produced for the industrial gas market by separating it from natural gas. This is referred to as "grey" hydrogen. This process can be decarbonised by capturing and storing the resulting carbon dioxide, with the hydrogen produced being referred to as low carbon or blue hydrogen. In contrast, green hydrogen is produced by electrolysis powered by renewable electricity.

Green hydrogen has the potential to feature as a key primary energy carrier in enabling Ireland to achieve net-zero greenhouse gas emissions by 2050, as evident by inclusion of actions 54a, 54b and 54c of the Interim Climate Actions 2021. Power-to-gas describes the production of hydrogen by electrolysis, i.e. the chemical decomposition of water into hydrogen and oxygen. The hydrogen produced is classified as green hydrogen when it is produced by renewable electricity and carbon does not feature in the production process or gas itself. Green hydrogen is the Irish Government's preferred production method in the long-term once both the production equipment and renewable electricity sources such as offshore wind scales up sufficiently.

The European Commission communication 'A Hydrogen Strategy for a Climate-neutral Europe' sets out the ambition for hydrogen in Europe, including a phased approach for hydrogen industry development. There is recognition that hydrogen is required to achieve full decarbonisation of the energy mix and will be needed to decarbonise high heat applications in industry and heavy use transport. The EC and the UK have signalled an intention to put substantial investment into hydrogen and establish it as a major pillar in their future decarbonised energy systems.

Potential demand side uses for Hydrogen span Industrial Processes, Transport, Power Generation and Heating sectors:

- Industrial Processes: Hydrogen, as a flammable gas, is a very suitable fuel for high heat industrial and manufacturing processes, offering an alternative decarbonisation pathway to electrification. Green Hydrogen has the potential to displace other fossil fuels in energy intensive industries, such as pharmaceuticals and cement production. There is an existing hydrogen demand within the industrial sector in Ireland and transitioning that existing demand to renewable hydrogen has been identified as an important first step.
- Transport: Gas Networks Ireland is a member of hydrogen in transport working group as part of the DECC hydrogen implementation group, which is an initiative focussed on developing hydrogen refuelling infrastructure for Ireland. Hydrogen may play a long-term role in heavy use transport, in vehicles carrying heavy loads or vehicles in constant use. The gas network may play a role in the hydrogen supply chain that serves hydrogen refuelling stations.
- Power Generation: Hydrogen fuelled power generation is at an early stage of development. It is, however, noted that major power generation equipment suppliers are engaged in evaluating both the use of hydrogen blends and 100% hydrogen in gas turbines. This opens the prospect of carbon-free large-scale long-duration dispatchable power generation. There is also the opportunity to store excess renewable electricity via power-to-gas as hydrogen and deploy fuel cell technology to convert the energy back to electrical form to help meet peak electricity demand periods or periods of low renewable generation.
- Heating: while it is currently seen as unlikely that Hydrogen will play a role in commercial and residential space heating, Hydrogen boilers have been developed for domestic use and commercial boilers are under development. Hydrogen-ready boilers, which are compatible with natural gas, may facilitate a lower cost and a low disturbance conversion in the future, if a change in policy were to drive investment in this area.

Readiness of the gas network for transport of hydrogen

For over 40 years, Gas Networks Ireland has safely transported natural gas through Ireland's national gas network. Gas Networks Ireland is committed to delivering a net-zero emissions network by 2045, a crucial element in delivering on the wider long-term decarbonisation challenge for Ireland. As part of this commitment, work has commenced to ensure the gas network will be ready to support the transport of hydrogen, as soon as volumes become available.

21 https://www.ehb.eu/files/downloads/EHB-2023-20-Nov-FINAL-design.pdf

Gas Networks Ireland is active in a number of European gas organisations that are assessing the readiness of existing gas networks to carry hydrogen and blends of natural gas and hydrogen. There is increasing confidence in the ability of the polyethylene distribution networks to carry up to 100% hydrogen. The polyethylene material itself is compatible and experience is being gained through demonstration projects on new and existing networks. Work on assessing the compatibility of steel transmission pipelines is ongoing and there is encouraging progress in identifying the challenges and mitigations associated with transporting hydrogen.

Gas Networks Ireland is a member of the Advisory Board of the EU funded HIGGS project (Hydrogen in Gas Grids) which aims to analyse the requirements of existing gas infrastructure and components to facilitate the injection of hydrogen into the high-pressure natural gas network. A testing facility has been constructed in Aragon, Spain as part of this project.

Furthermore, a technical and safety feasibility study published by Gas Networks Ireland in December 2022, "Injecting green hydrogen blends into Ireland's gas network"[22] examined the ability of the gas network to transport blends and 100% hydrogen by applying the evidence generated in other jurisdictions, most notably in Britain. The report found Ireland's gas distribution network is similar to the British distribution network and is largely compatible with hydrogen blends of up to 20% and even 100% hydrogen with only some modifications required. In addition, the report determined that Ireland's gas transmission network is also compatible with hydrogen blends, however materials testing is required for around 50% of pipelines on the network to allow current maximum operating pressures to be maintained with hydrogen concentrations of greater than 10%. A materials testing programme is currently being developed with testing due to commence in 2025. Some targeted research on certain equipment contained within transmission AGIs and compressor stations will also be required. Across the UK and the EU, there are multiple studies underway testing the compatibility of transmission network equipment (e.g., National Gas HyNTS (FutureGrid), Gasunie programmes, Hydrogen in Gas Grids (HIGGS), GERG and EPRG hydrogen programmes) which will support Gas Networks Ireland in this research. In the case of the FutureGrid project in the UK, National Gas published its Phase 1 findings in July 2024 and successfully tested hydrogen blends of up to 100% on a simulated off-grid gas transmission network.

Gas Networks Ireland continues to monitor hydrogen developments in other jurisdictions. Notably in the UK, where future developments may determine the potential availability of hydrogen at the Moffat Entry Point. The Acorn Hydrogen Project[23] is a hydrogen production facility being developed at St Fergus, Scotland. An update to the UK Hydrogen Strategy[24] was issued in August 2023, outlining a doubling of the ambition for Hydrogen production from 5GW to 10GW of low carbon hydrogen production capacity by 2030, a move which was first announced by the UK Government in their British Energy Security Strategy in 2022[25] .

Gas Networks Ireland is also actively supporting the work of the Gas Technical Standards Committee (GTSC) of the National Standards Authority of Ireland (NSAI) to develop Irish and European Gas infrastructure standards for hydrogen and hydrogen blends on existing natural gas networks. The European standards body CEN is currently undertaking a programme of pre-normative research to support this work and NSAI has established a Hydrogen Coordination Committee under the GTSC to ensure full engagement by Ireland with the programme.

Gas Networks Ireland is also a member of the European Hydrogen Backbone (EHB) initiative which consists of a group of thirty-one energy infrastructure operators, united through a shared vision of a climate-neutral Europe enabled by a thriving renewable and low-carbon hydrogen market.

The EHB initiative aims to accelerate Europe's decarbonisation journey by defining the critical role of hydrogen infrastructure, based on existing and new pipelines, in enabling the development of a competitive, liquid, pan-European renewable and low-carbon hydrogen market. The initiative has developed detailed hydrogen pipeline network maps envisaging how Ireland could be connected to the wider European hydrogen backbone by 2040.

Gas Networks Ireland has developed a Network Innovation Centre at the Brownsbarn AGI site in Dublin with funding from the Gas Innovation Fund. This facility is independent of the gas network and will use blends of natural gas and hydrogen for the purposes of assessing the compatibility of hydrogen with elements of the distribution network and gas appliances used in Ireland. Gas Networks Ireland maintains links with a number of Ireland's leading academic institutions which are conducting research into the potential role of hydrogen in Ireland. Working in conjunction with University College Dublin, a wide range of tests are underway to gain a better understanding of natural gas/hydrogen blends.

22 Hydrogen-Feasibility-Study.pdf (gasnetworks.ie)
23 Acorn | Growing Our Decarbonised Future (theacornproject.uk)
24 Hydrogen Strategy: Update to the market, August 2023 (publishing.service.gov.uk)
25 British energy security strategy - GOV.UK (www.gov.uk)

The facility will be able to begin the process of evaluating aspects of the network that are particular to Ireland and will also provide an opportunity for Gas Networks Ireland staff and stakeholders to gain experience of hydrogen blends. This begins the process of ensuring that Ireland's existing gas infrastructure is capable of safely transporting and storing hydrogen.

Technical experts from Gas Networks Ireland and the University College Dublin (UCD) Energy Institute completed a report on the impact of introducing green hydrogen with natural gas on home appliances in 2022[26]. They found that appliances remain fully functional using a natural gas blend of up to 20% hydrogen. This means households in general will not need to make any changes to their existing domestic appliances or notice any difference.

Their research also outlines that significant reductions in emissions can be achieved by blending hydrogen with natural gas. Examples of which include the following average emissions reductions for a standard domestic gas boiler operating at maximum load:

- 12% reduction in carbon dioxide (CO_2)
- 37% reduction in carbon monoxide (CO)
- 40% reduction in nitrogen oxides (NOx)

As part of a second phase, Renewable Hydrogen and End-users' Considerations for the Transition to a Renewable Gas Network (HyEnd) was studied on a national scale. This study[27] examines the limits of Large Daily Metered (LDM) and Daily Metered (DM) Irish gas customers in using gas with a hydrogen blends up to 20%. A questionnaire was designed to survey Industrial and Commercial customers to investigate the threshold levels for hydrogen blend consumption. The survey involved a total of 42 LDM end users, consisting of 7 gas-fired power plants and 35 large industrial units, as well as 270 DM end users across the country. The DM category includes customers from the hospitality and education sectors, as well as hospitals, apartment blocks and shopping centres. The results showed that the majority of LDMs (90%) and DMs can operate using existing equipment with up to 20% hydrogen blends. The remaining 10% of LDM end-users, which operate gas turbines, can currently operate with up to 5% hydrogen blends.

Gas Networks Ireland is participating in project HyLIGHT, a 3-year project funded by Science Foundation Ireland (SFI) and an industry consortium through MaREI, the SFI Research Centre for Energy, Climate and Marine, University College Cork (UCC), Dublin City University (DCU) and University of Galway. The overall aim of HyLIGHT is to provide the knowledge, data and the necessary tools to guide the cost-effective decarbonisation and roadmaps for sustainable large-scale implementation of hydrogen technologies in Ireland to enable sector integration for a zero-carbon, secure, resilient energy system.

Next Generation Energy Systems (NexSys) is an all-island, multidisciplinary energy research programme. NexSys is hosted by the UCD Energy Institute in partnership with eight other leading research institutions: ESRI, DCU, Queen's University Belfast, University of Galway, Maynooth University, Trinity College Dublin, UCC, and Ulster University. Gas Networks Ireland is a co-funding industry partner, supporting and working with NexSys. By 2027, NexSys will have identified credible and accelerated pathways for a net-zero energy system and have developed technologies and the resources needed for the energy transition.

Gas Networks Ireland are undertaking a joint research project with Ulster University in relation to Pre-normative research on the safety of gas networks with hydrogen blends. The project will collaborate with the European Gas Research Group (GERG) to undertake research on safety aspects of the transportation of hydrogen blends on the gas transmission and distribution network with the aim of developing innovative preventive and mitigation strategies.

Renewable electricity developers are engaging with Gas Networks Ireland, exploring the potential for hydrogen production and injection into the gas network. This has resulted in several connection enquiries being received and responded to, and several formal connection enquiries in progress. This provides an early indication of the level of interest there may be from renewable developers to enter a new green hydrogen production market. Gas Networks Ireland is investigating the implications of hydrogen producers connecting to the network, including evaluating appropriate locations, and assessing storage requirements. Further engagement with prospective producers will further develop technical requirements and identify the costs associated with hydrogen injection.

A key step in achieving hydrogen readiness is the development of a hydrogen safety case that meets the requirements of all applicable standards, regulatory requirements and national policy. Gas Networks Ireland is currently developing a detailed hydrogen technical and safety strategy which will ultimately provide a road map for the business to transition to hydrogen. This will acknowledge the technical challenges, assess the impact and propose an implementation process for delivery of the technical strategy. The development of the technical strategy will include a high-level impact assessment which identifies the key risks associated with the transition to hydrogen and will be key in providing clear evidence that the transition will be managed to a risk level that is as low as reasonably practicable. The technical strategy will complement existing Gas Networks Ireland knowledge, experience and hydrogen initiatives, some of which are outlined above.

Carbon capture and storage (CCS)

Carbon Capture and Storage (CCS) is a suite of technologies that can effectively capture carbon dioxide (CO_2) emissions produced from industrial processes and the use of fossil fuels in electricity generation and industrial heating, significantly reducing the amount of carbon dioxide entering the atmosphere. The captured CO_2 is then compressed and conditioned and transported to a suitable storage site, either an offshore depleted gas field or a saline aquifer. CCS is considered crucial for meeting global climate targets by reducing greenhouse gas emissions.

The sectoral emissions ceilings, agreed by the Government in July 2022, include unallocated savings in the second carbon budget period from 2026-2030. The Climate Action Plan 2024 notes the potential need for CCS to achieve some of these unallocated savings, especially in difficult-to-abate sectors. The SEAI's Carbon Capture Utilisation and Storage: Suitability, Costs and Deployment Options in Ireland[28] highlights the potential of carbon removals in Ireland within the second carbon budget period from 2026-2030. Furthermore, as part of their review of Ireland's draft Updated NECP 2021-2030[29] , the European Commission recommended that future iterations of the NECP identify the amount of CO_2 emissions that could be captured annually by 2030, including the source & storage capacity.

Gas Networks Ireland will continue to monitor ongoing activity in relation to CCS in Ireland and will incorporate the outcomes into potential future decarbonisation pathways as appropriate.

26 British energy security strategy - GOV.UK (www.gov.uk)
27 Irish Industry ready to take up to 20% blends of hydrogen
28 SEAI National Heat Study - Carbon Capture Utilisation and Storage
29 gov.ie - Ireland's draft updated NECP 2021-2030

5. Historical demand & supply

Key Messages:

- Annual ROI gas demand for 2023/24 was 3.4% lower than for 2022/23.
- Power Generation experienced a 7.9% reduction in demand in 2023/24 which was largely due to a significant increase in electricity imports from GB displacing gas-fired generation.
- Industrial and Commercial saw a 4.7% increase in demand in 2023/24 vs. 2022/23.
- Residential demand was up 0.4% in 2023/24 vs. 2022/23; when weather-corrected, Residential demand was up 1% in 2023/24 vs. 2022/23.
- In 2023/24, 22% of ROI gas demand was met by indigenous sources of supply. The balance of supply (78%) was supplied via the Moffat Entry Point in Scotland.

This section relates to a Gas Networks Ireland review of the historic profiles for supply and demand. Historic annual gas demand and peak day gas demands are analysed as well as historic gas supplies.

5.1. ROI annual primary energy requirement

The Sustainable Energy Authority of Ireland (SEAI) reported that Ireland's Total Primary Energy Requirement (TPER) for 2023 decreased by 1.8% compared to 2022.

As shown in Figure 5-1, oil remains as the highest share of the TPER in 2023, accounting for 48.8% of total energy demand. Gas accounted for 29.4% of 2022 TPER, a decrease in the share of 1.7% vs. 2022. Renewable energy sources accounted for 14.2% of TPER in 2023, increasing by 1.2% compared to 2022. Electricity imports accounted for 2% of total energy demand in 2023, increasing from 0.1% in 2022.

5.2. Historical annual gas demand

This section refers to both Gas Networks Ireland System Demand and ROI gas demand. The Gas Networks Ireland System demand refers to the combined demands for ROI, Northern Ireland (NI) and Isle of Man (IOM).

Annual ROI gas demand for 2023/24 was 3.4% lower than 2022/23 demands. This decrease continues similar trends seen in the past three years where ROI gas demand decreased by 4.3%, 0.3% and 3.9% in 2022/23, 2021/22 and 2020/21 respectively year-on-year (YoY). The main drivers for the recent YoY decreases include:

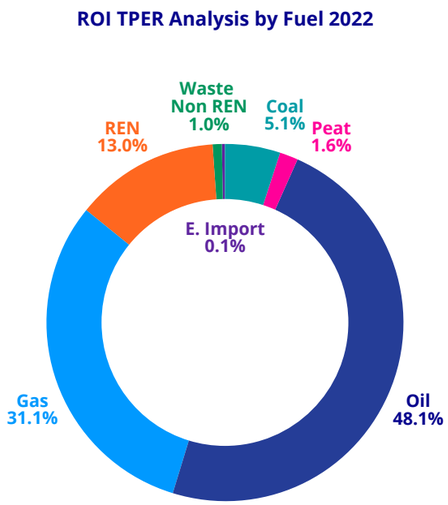
- A sharp increase in gas prices at the end of 2021, with sustained high prices throughout 2022.
- Warmer than average temperatures in 2022/23 and 2023/24.
- Increased electrical imports from GB, particularly since the start of 2023.
- Sustained outages at some large gas-fired generators in 2022.

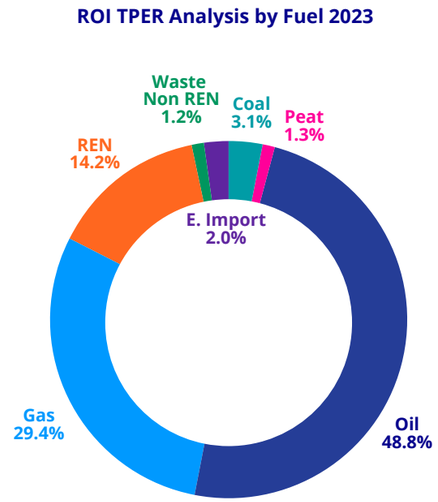
In the Power Generation sector, gas demand experienced a 7.9% reduction in 2023/24 compared to 2022/23. This was largely due to the increase in electrical imports from GB displacing gas-fired generation.

Looking at the past decade, Power Generation sector gas demand has broadly increased up to 2020; the increase in demand in this period, despite growth in wind capacity, can be attributed to increasing electricity demand, sustained outages at other thermal generators (i.e. coal and oil), and the flexible nature of gas-fired generation. Since 2020, overall, Power Generation gas demand has declined slightly with the increasing penetration of renewables, an increase in electricity imports and some sustained outages for gas-fired generators.

The Industrial & Commercial (I&C) sector annual gas demand for 2023/24 was 4.7% higher than 2022/23. This increase is following a series of YoY decreases due to the impact of Covid-19 and the elevated gas prices in late-2021 and 2022.

Figure 5-1: ROI TPER analysis by fuel (2022 & 2023)





Increased by 4.3% in 2023/24 compared to the previous year. DM demand on the transmission network increased by 7.2% in 2023/24 while distribution-connected DM demand increased slightly by 0.4%. The increase in DM demand relates to an increase in existing customer demand YoY. There was a 5.2% increase in the I&C portion of Non-Daily Metered[30] (NDM) demand in 2023/24. It is worth noting that the NDM sector is influenced by weather; when weather corrected, I&C NDM demand was up 5% compared to 2022/23.

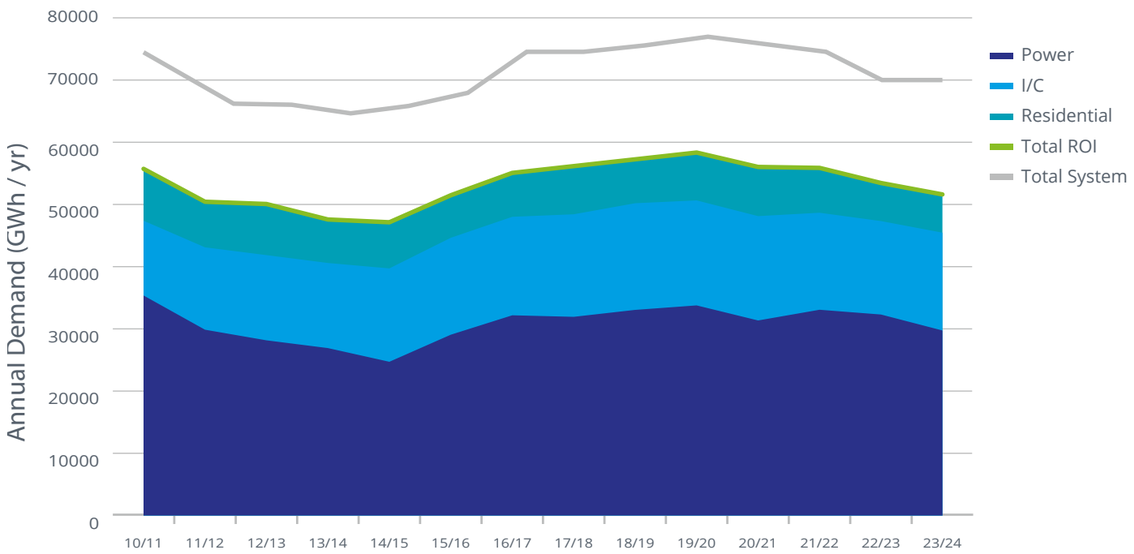
Residential demand has remained virtually unchanged in 2023/24 increasing by only 0.4% compared to 2022/23. When weather-corrected, residential gas demand was 1% higher than for the corresponding period in 2022/23.

This follows a couple of years of significant decreases in Residential demand; 2022/23 demand fell by 15% vs. 2021/22 while 2021/22 demand was down 9% vs. 2020/21. Changing customer behaviour, coupled with milder winters since 2021/22, drove this decrease in demand with Annual Quantities (i.e. annual gas demand per household) revised down by c. 10% by 2024. This decrease also follows a period of high gas prices. It remains to be seen whether the decrease in household demand will be apparent in the future as it is dependent on future winter weather conditions and trends in gas prices influencing customer behaviour.

Transport sector gas demand increased by 47% in 2023/24, with 35 GWh of demand across the gas year, as the roll-out of a nationwide CNG fuelling network continues.

Total ROI gas demand decreased by 4.3% in 2023/24 compared to the previous year. NI gas demand increased by 15.2% compared to 2022/23 while IOM demand fell by 14.9% YoY. Gas Networks Ireland System annual gas demand for 2023/24 increased by 0.5% compared to the previous year. Historic gas demand is presented in Figure 5-2 below.

Figure 5-2: Historical annual gas demand



30 The Non-Daily Metered (NDM) sector refers to those who consume less than 5.55 GWh of gas annually. This covers small I/C and residential properties

5.3. Historical peak day gas demand

The ROI peak day gas demand for 2023/24 was 250.8 GWh/d, which occurred on 1st of December 2023. While cold weather conditions were observed on this day, it was not a 1-in-50 severe winter peak, rather the peak day was driven by gas demand in the Power Generation sector. This peak day was 4.2% lower than the ROI peak day for gas demand observed in 2022/23 of 261 GWh/d, which was the highest daily gas demand ever recorded at the time of writing this report.

The peak daily gas demand for Power Generation also occurred on the 1st of December with demand in this sector representing 62% of the total gas demand. There was no change YoY in the peak daily power generation gas demand of 156GWh.

Gas-fired power generation accounted for 71% of the ROI electricity fuel mix on the 1st December 2023, with wind generation well below average, contributing to 3.5% of generation, and other thermal (i.e. coal-fired, oil-fired and co-fired biomass/peat) generation providing 10.5%. It is noted that ROI was net importing on the peak day, providing 5.6% of demand.

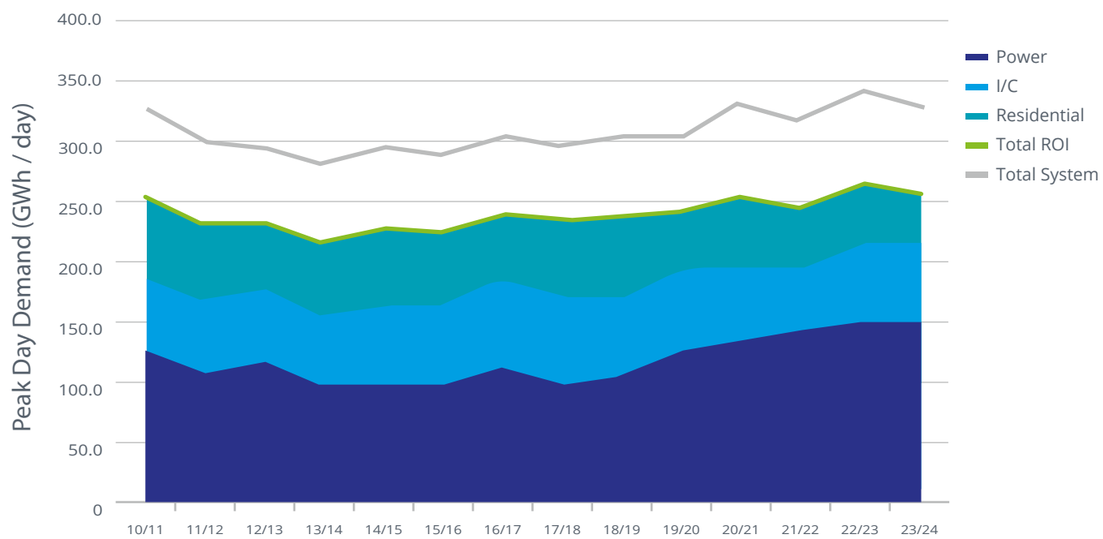
Gas demand in the residential sector, representing 16% of total peak day demand, decreased by 25% for the 2023/24 peak day vs. the previous year. In contrast, Industrial and Commercial demand on the peak day, representing 21.5% of total peak day demand, increased by 4.4% in 2023/24.

The peak day demand in the NDM sector occurred on the 18th January 2024, with gas demand reaching 72.4 GWh/d. This is 3.6% lower than the corresponding NDM peak day in 2022/23.

The Gas Networks Ireland system 2023/24 peak day gas demand was 328.1GWh/d, 5.1% lower than the 2022/23 peak. NI peak day gas demand was also down by 5% while the IOM peak day demand was the same as for 2022/23.

Figure 5-3 below illustrates the change in peak day demand since 2010/11.

Figure 5-3: Historical peak day gas demand



5.4. Ireland's weather

Based on a Degree Day[31] DD) comparison, the most recent winter (October 2023 to March 2024) was approximately 1% colder than the previous year. Relative to the long run degree day average, winter 2023/24 was slightly warmer (-1%) than 2022/23.

The coldest day in winter 2023/24, occurred on the 17th January of 2024, with an average temperature of -1.2°C, or a 16.7 DD. Peak NDM demand for 2023/24 occurred on this day, demonstrating the effect of weather on this demand sector. It is notable that total ROI gas demand on this day was not the peak gas demand day for winter 2023/24; while electricity demand was 3% higher on this day compared to the peak gas demand day (1st December 2023), both wind generation and electricity imports were substantially higher, offsetting any potential increase in gas-fired generation.

5.5. Wind powered generation

The installed all-island wind generation capacity increased by 3.3% in 2023 from the previous year, totalling 6GW installed capacity by end-2023, 4.7GW of which is located in ROI[32] . Wind powered generation output in ROI increased by 4% in 2023 compared to 2022, indicating that wind generation load factors were similar in 2023 compared to the previous year.

On the peak day for wind generation in Gas Year 2023/24, daily wind powered generation accounted for up to 70% of ROI daily electricity demand (6th December 2023). Wind accounted for only 2% of demand on the minimum day for wind generation (14th July 2024). On the 2023/24 peak day for gas demand (1st December 2023) wind accounted for c. 3% of ROI electricity demand.

5.6. Electricity interconnectors

There are currently two electrical interconnectors between Great Britain and the island of Ireland – the East West Interconnector (EWIC) in ROI and the Moyle Interconnector in Northern Ireland, with import capacities of 500 MW and 450 MW respectively.

Up until early 2015, the prevailing market conditions on the Single Electricity Market (SEM)[33] and its UK equivalent, BETTA (British Electricity Trading and Transmission Arrangements) resulted in a predominantly GB-IE flow on the EWIC, i.e. import of electricity from GB. Following this, the carbon price floor in GB was raised to £18 per ton CO_2 in April 2015 and this relationship, along with changing fuel price dynamics and tightening capacity margins in the UK, contributed to reversing the balance of electricity flows on the interconnectors, in favour of IE-GB exports.

Following the upgrade of the Single Electricity Market (SEM) via the Integrated Single Electricity Market (I-SEM) project in October 2018, electrical interconnector behaviour has generally been efficient in that the interconnectors are generally importing to Ireland when SEM prices are higher than GB markets, and exporting at times of high wind when prices in the SEM are lower than in GB[34].

With the withdrawal of the UK from the European Union, a UK Emissions Trading Scheme (UK ETS) replaced the UK's participation in the EU ETS on 1st January 2021. Similar to the EU ETS, the scheme applies to energy intensive industries, the Power Generation sector and Aviation. The first UK ETS auction was held on 19th May 2021, with subsequent auctions being held every two weeks. The UK ETS price generally tracked the EU ETS price until March 2023, at which point the UK price began trading at a discount to the EU prices driven by the UK Government's move to increase the amount of allowances available within the cap and trade system. The change has damped UK electricity prices, driving power prices below those in the SEM, and has notably driven increased electricity imports to Ireland since early-2023. It had been proposed that the UK ETS and EU ETS markets be linked in the future but a definitive plan for this link has not emerged.

31 A Degree Day is a measure of heating or cooling, and represents a fall or rise of one degree Celsius below or above a specified average outdoor temperature

32 System-and-Renewable-Data-Summary-Report

33 The Single Electricity Market (SEM) is the wholesale electricity market operating in the Republic of Ireland and Northern Ireland.

34 SEM committee Single Electricity Market Performance Quarterly Reports, available at https://www.semcommittee.com/publications

From January 2026, with the implementation of the Carbon Border Adjustment Mechanism (CBAM), as outlined in section 4.1 above, it is expected that electricity imports from GB from 2026 onwards will incur the full cost of the EU ETS where applicable. In theory, this would have the result of decreasing electricity imports to Ireland, due to the expected reduction in the price differential between electricity imports from GB and the marginal price in the SEM. In 2023/24, net imports to ROI increased by 120% vs. the previous year (2022/23); in 2023/24 imports accounted for 14.7% of the ROI fuel mix, up from 6.8% in 2022/23. The increase in net electricity imports from Great Britain is driven by the following shifts in the GB electricity market:

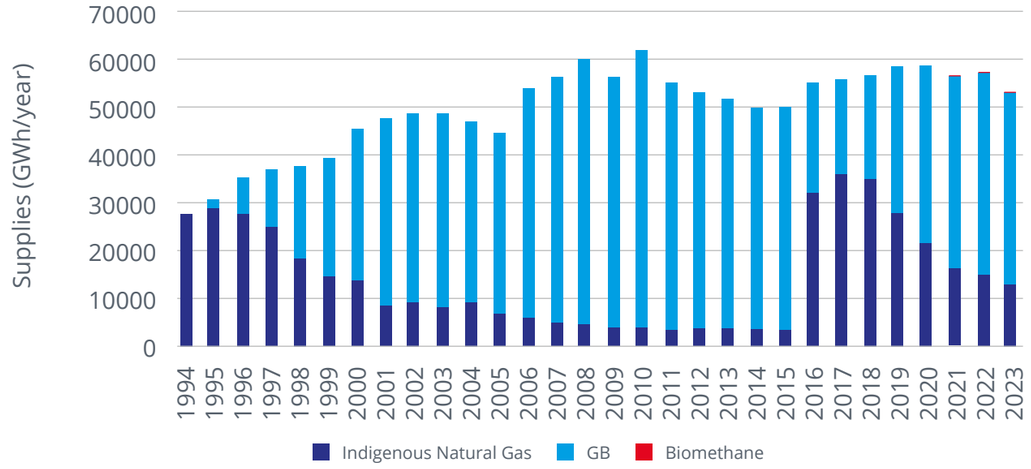
- A significant drop in the UK's carbon price relative to the EU.
- Lower Carbon intensity of electricity generation within GB vs. the SEM.
- Higher electricity imports into GB via other European interconnectors.

There are several proposed electrical interconnector projects at various stages of development that are seeking to connect to the Ireland and Northern Ireland transmission networks. These include the Greenlink Interconnector, linking Ireland and Wales's electricity networks, which is currently projected to be commissioned in early 2025, and the Celtic Interconnector, linking France's electricity network to Ireland, with a projected commissioning date in 2026 and commencing operation in 2027.

5.7. Historic gas supply

In 2023, 22.4% of ROI gas demand was supplied from indigenous sources (Corrib and Biomethane). The balance of supply (77.6%) came through the subsea interconnectors via the Moffat Entry Point in Scotland. Figure 5-4 below shows the historic trends in indigenous vs. imported gas supplied to the network.

Figure 5-4: Historic Annual indigenous (IND) gas production and Great Britain (GB) imports



The share of biomethane in the ROI supply continues to grow, more than doubling between gas years 2022/23 and 2023/24, increasing from 30GWh to 59.7GWh.

6. Gas demand forecasts

Key Messages:

- Gas Networks Ireland has developed Low, Best Estimate & High demand scenarios which forecast gas demand across the Power Generation, Industrial and Commercial, Residential and Transport sectors.
- In the Best Estimate demand scenario, annual ROI gas demand is expected to decrease by 14% between 2023/24 and 2032/33.
- The 1-in-50 ROI peak day forecast is expected to reach its highest point across the NDP horizon in 2025/26, which equates to 11% growth between 2023/24 and 2025/26. The peak day forecast is projected to grow by 6% between 2023/24 and 2032/33.
- Annual gas demand in the Powergen sector is projected to decrease by 27% across the NDP horizon, driven by the significant increase in the projected amount of renewable installed capacity directly offsetting more gas-fired generation year-on-year.
- In contrast, peak day gas demand is projected to increase by 6% across the NDP horizon; gas-fired power generation is expected to continue to be the dominant supply source for Ireland's electricity requirements on days of low renewable generation.
- The trends in both annual and peak day power generation gas demand are directly affected by the quantity and direction of forecast flows on the electricity interconnectors, which favour electricity imports in the Best Estimate, directly offsetting a portion of gas demand. Actual future interconnector flows will be impacted by both future market prices and regulatory conditions.
- A sensitivity was run where the largest available interconnector was excluded from the peak day forecast. In this scenario, the 1-in-50 ROI peak day forecast reaches its highest point in 2025/26, equating to 19% growth between 2023/24 and 2025/26. Across the 10-year NDP horizon, the peak day grows by 14% in this sensitivity.
- Annual gas demand in the Residential sector is forecast to decline by 26% between 2023/24 and 2032/33 due to disconnections driven by electrification of heating and district heating uptake, and energy efficiency improvements resulting in lower gas demand in existing customer dwellings.
- Industrial and Commercial annual gas demand is forecast to increase by 11% across the NDP period. Growth in these sectors is driven by new connections and growth in existing customer demand linked to economic growth. Gas demand growth in this sector is partially offset by customer disconnections due to the uptake of low carbon and renewable heating technologies and due to energy efficiency measures implemented by existing customers.
- CO_2 Emissions related to ROI gas demand have been calculated and comparisons made to the Sectoral Carbon Budgets. In the Best Estimate, CO_2 emissions are forecast to decrease by 33% by 2032/33. This calculation includes a zero emission factor for renewable gases which directly offsets natural gas.

The following section presents an overview of the gas demand outlook for the period 2023/24 to 2032/33. The NDP forecasts future gas demands by examining the development of individual Power Generation, Industrial & Commercial, Residential and Transport sector gas demands.

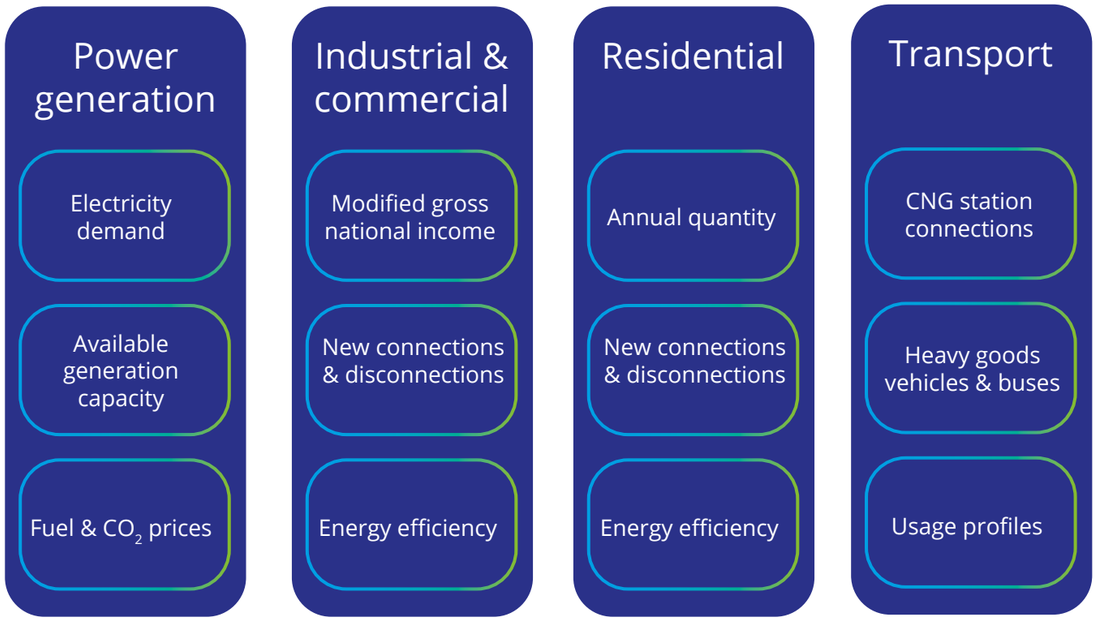
6.1. Gas demands

The demand forecasts presented in this section refer to ROI demand only, unless otherwise stated. Gas Networks Ireland system demand refers to the total demand transported through the Gas Networks Ireland system, i.e. the combined demands for ROI, NI and IOM. Gas Networks Ireland system demand forecasts are presented in Appendix 2.

6.2. Gas demand forecasting

The demand forecast modelling methodology[35] used in producing the NDP generates a 10-year forecast for the Power Generation, Industrial & Commercial, Residential & Transport sectors, based on a series of assumptions[36] which affect demand for each of these sectors. The primary forecasting inputs by sector are summarised in Figure 6-1.

Figure 6-1: Key demand forecasting assumptions



The primary demand forecast outputs for each of the scenarios under review are as follows:

- The 1-in-50 winter peak day, i.e. a severe winter peak day that is statistically likely to occur once every fifty years;
- An average winter peak, i.e. a winter peak day that would occur in a typical winter (most years); and
- Annual demand forecasts i.e. the total demand for each year of the forecast.

The demand forecast is key in assessing the adequacy of the transmission network and associated assets to provide sufficient gas supply to our customers. The network analysis identifies the areas of the network that will require future development/investment, and as such, the methodology and inputs to the demand forecast are rigorously assessed and verified.

35 Gas Networks Ireland have developed a document outlining the Methodology for forecasting gas demand. This document is available for download via the following link: https://www.gasnetworks.ie/docs/corporate/company/Gas-Forecasting-Methodology-Report.pdf

36 A number of external data sources are referenced when generating future gas demands along with additional sector specific assumptions. Details of these assumptions are set out in Appendix 2

Table 6-1: 1-in-50 Peak day Actual vs. Forecast

Year	Actual		Forecast		Variance
	(GWh/d)	(mscm/d)	(GWh/d)	(mscm/d)	(%)
2009/10	253	22.9	246	22.3	2.8
2010/11	251	22.7	249	22.5	0.8

The 2009/10 and 2010/11 1-in-50 peak days were driven by cold weather conditions resulting in increased gas demand. The average temperature across each of these 1-in-50 days was –5°C and –8°C on the 7th of January 2010 and 24th of December 2010 respectively. In the intervening years, average daily gas demand has increased, particularly with the increasing gas demand for electricity. As a result, the average winter peak days observed in recent years, i.e. in 2023 and 2024, have reached, and in some cases surpassed, the actual 2009/10 and 2010/11 1-in-50 peak days shown here.

Hence, with the increasing penetration of intermittent renewable electricity generation, and the expected commissioning of new gas-fired generators within the NDP period, in future, the composition of the 1-in-50 peak day is likely to be driven by high gas demand in the power sector which is compensating for low wind conditions coupled with low ambient temperatures simultaneously driving up commercial and domestic gas demand.

Gas Networks Ireland has undertaken statistical analysis to understand the conditional probability of such events, that is of low wind conditions occurring given 1-in-50 cold ambient temperatures. Historic wind capacity factors for 1982 to 2019 inclusive from ENTSO-E European Resource Adequacy Assessment (ERAA) 2023 were analysed in conjunction with the GNI 1-in-50 peak year weather statistical methodology. The analysis determined that whilst low wind conditions (5-10% wind capacity factor) can occur throughout the year, there is a higher likelihood of wind capacity factors being less than 10% during a 1-in-50 cold weather day with capacity factors <10% typical and a probability of <5% half the time. In NDP 2024, the 1-in-50 peak day forecast has been revised to model both very low ambient temperatures and very low wind conditions. The average winter peak methodology is unchanged and applies a stochastic selection of wind and solar profiles to understand the typical variability in renewable generation year-to-year. Given that this is an update to Gas Networks Ireland's forecast methodology, an update will be made, in tandem with the publication of the NDP, to our current gas demand forecasting methodology[37]. The average year peak day forecast is also considered for additional analysis that may be undertaken to assess the adequacy of the network to meet peak flows during a typical winter, as is the annual demand total.

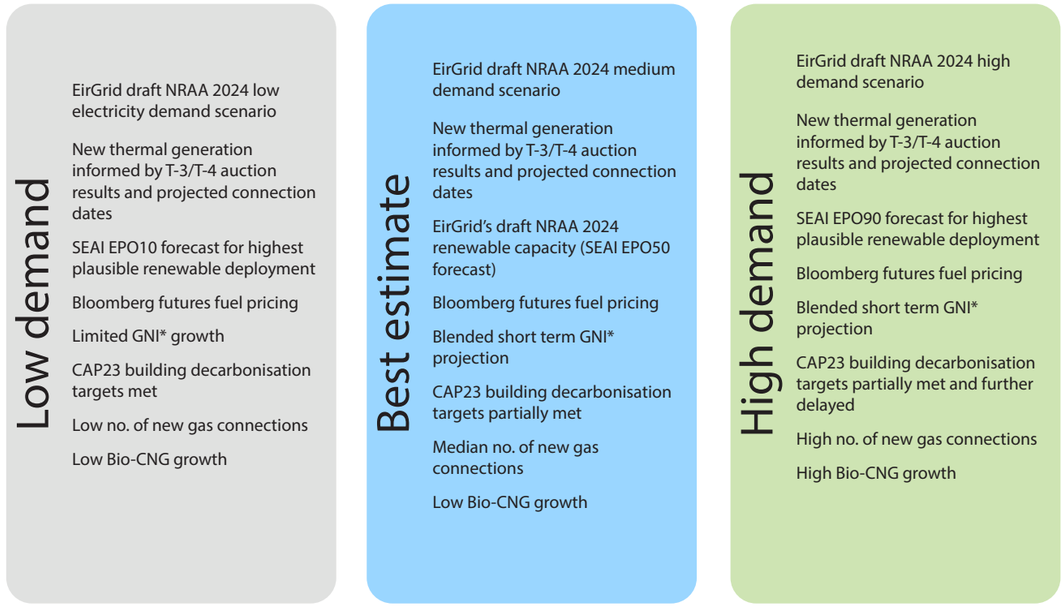
The average year peak day forecast is also considered for additional analysis that may be undertaken to assess the adequacy of the network to meet peak flows during a typical winter, as is the annual demand total.

6.3. Gas demand scenarios

In order to assess a range of possible gas demand trajectories, Gas Networks Ireland has developed three gas demand scenarios for the period 2023/24 to 2032/33, namely Low, Best Estimate and High demand scenarios. These scenarios are designed to represent a broad range of likely outcomes and are informed by a range of external and internal factors, some of which are highlighted in Figure 6-2 below.

37 Methology for forecasting gas demand (gasnetworks.ie)

Figure 6-2: Gas demand scenarios overview



These scenarios represent a range of potential gas demands, to be used for network planning purposes to test the capability of the gas network. Gas demand is dependent on a number of external factors, including economic growth, electricity demand growth, progress towards decarbonisation targets outlined in national policy and other Power Generation sector developments, such as the connection dates of new electricity interconnectors. The Best Estimate scenario is designed to take the median view in terms of how these factors will develop over time.

6.4. Demand forecast assumptions

This section presents an overview of the assumptions made for the gas demand outlook for the period 2023/24 to 2032/33.

6.4.1. Power generation sector

The Irish gas and electricity sectors are highly interdependent. Gas is a critical component of Ireland's electricity generation, producing 43%[38] of the country's annual electricity requirement in 2023. Gas-fired generators are the largest customer sector in the gas market, accounting for approximately 60% of the total ROI gas demand in 2023.

The following summarises the main assumptions regarding the changes in the SEM generation portfolio, as per the draft EirGrid and SONI National Resource Adequacy Assessment (NRAA) 2025-2034:

- In 2023, closure notices were issued for the Moneypoint coal/heavy fuel oil (HFO)-fired power plants effective from October 2024. In the meantime, the three units qualified for capacity payments for a further year in the T-1 2024/25 auction[39] . These units are expected to remain available for electricity production until July 2025 as per EirGrid's draft NRAA assumption, after which time the three units may remain online for emergency generation purposes only out to March 2029[40].
- From July 2025 onwards, Moneypoint will be dispatched as a generator of last resort, and will not participate in the I-SEM markets. As a result, Gas Networks Ireland has excluded these units from our economic dispatch modelling in all three of our demand scenarios from July 2025 onwards. Moneypoint will be dispatched by EirGrid under similar rules to Temporary Emergency Generation (TEG) from July 2025 onwards, as outlined further below in the section on TEG.

38 Electricity (seai.ie)
39 FCAR2425T-1-report.pdf (sem-o.com)
40 Security_of_Electricity_Supply_Retention_of_Moneypoint_Units_Information_Paper.pdf (divio-media.com)

- All four Tarbert HFO-fired units (TB1, TB2, TB3 and TB4) were retired as scheduled at the end of 2023. Consequently, these units are no longer in operation and are not included in any scenarios for the NDP 2024 study.
- Regarding the Aghada gas-fired OCGT unit (AT1), the termination notice for this unit has been rescinded. As a result, AT1 remains operational and is included in all scenarios for the NDP 2024. AT1 remains in EirGrid's generation mix in their draft NRAA out to 2034.
- In Northern Ireland, the two coal/HFO-fired generators at Kilroot (ST1 and ST2) retired as scheduled at the end of 2023, due to emissions restrictions resulting from the Industrial Emissions Directive (IED).
- The Edenderry power plant has transitioned from co-firing peat and biomass to using 100% biomass and will operate exclusively on biomass out to 2030, at which point the plant's planning permission is due to expire. On this basis, Gas Networks Ireland assumes that Edenderry will be available in all NDP scenarios until 2030.
- Gas Networks Ireland has assumed that the North-South Interconnector is available from 2028 onwards to import and export electricity. This timeline is aligned with the current expectation from SONI for commissioning and operation of the interconnector. EirGrid and SONI remove capacity constraints between NI and ROI in 2027 in their draft NRAA and as a result their system adequacy assessment is completed on this basis from 2027 onwards.
- There are several proposed electrical interconnector projects linking Ireland to other jurisdictions including the Greenlink Interconnector with Great Britain (GB) and the Celtic Interconnector with France. In EirGrid's draft NRAA, the Greenlink Interconnector was initially due to be operational by the end of 2024 and the Celtic interconnector is assumed to be commissioned and fully operational by 2027. Gas Networks Ireland assume the Greenlink interconnector is available from April 2025 based on latest available information from EirGrid's Winter Outlook 2024/25[41] while the Celtic interconnector is assumed to be on-time and operational from January 2027 onwards.
- The Low scenario assumes that one further electrical interconnector, with a capacity of 750MW, is operational by the start of 2031 connecting the SEM to GB.
- Gas Networks Ireland have included new entrant generators which were successful in the T-3 and T-4 capacity auctions officiated by EirGrid to date. Gas Networks Ireland engage with individual gas generation developers in order to develop a timeline for delivery of their awarded capacity. The majority of the contracted T-3 and T-4 capacity is anticipated to be delivered within the corresponding 18-month long stop date as defined in the Capacity Market Code. Where Gas Network Ireland's expected gas-on delivery date for any of these individual units fall outside the long-stop date, it is still assumed that the project goes ahead. Where termination notices have been issued by entrants, and Gas Networks Ireland have also been notified of a cessation of interest in executing a gas network supply contract, the relevant project has been omitted from our scenarios.
- Similar to our approach on Moneypoint, Gas Networks Ireland has excluded any Temporary Emergency Generation (TEG), from both gas- and distillate-fired units, which has been procured by EirGrid as part of the CRU Security of Supply Programme[42], whose availability in the short- to medium-term will seek to address the shortfall in capacity identified in recent capacity assessments until additional capacity procured in the latest T-4 capacity auctions has been commissioned. The TEG will not participate like other market units in the I-SEM, i.e. they will not normally be available for balancing actions unless for supply risk reasons and will not participate in the capacity auctions or provide ancillary services as they are intended to be dispatched as a generator of last resort. Furthermore, there is also no unserved electrical demand within the NDP model to trigger the dispatch of these generators, hence their exclusion from the NDP model.

The Irish Government's latest published update to the Climate Action Plan, CAP 2024, targets 80% Renewable Energy Share in Electricity (RES-E) by 2030. Achieving this target is directly dependent on the timely build-out of renewable capacity identified in the CAP 2024.

In EirGrid's draft NRAA 2025-2034, the projected renewable build-out rates fall short of the CAP 2024 targets for onshore wind, offshore wind and solar PV by 21%, 73% and 22% respectively. Gas Networks Ireland's Best Estimate scenario aligns with EirGrid's draft NRAA forecast build-out rates for renewable capacity and, as a result, achieving 80% RES-E by 2030 is very challenging, assuming that electricity demand grows in line with EirGrid's median scenario. As regards Gas Networks

41 https://cms.eirgrid.ie/winter-outlook-202425
42 Electricity Security of Supply Programme of Work Update October 2023

Ireland's Low and High scenarios, industry expert's views are incorporated into each scenario respectively which include a view on both the maximum and minimum renewable capacity achievable over the coming decade[43]. The Low scenario falls short of the total CAP 2024 target of 22GW by 2030 by just 7%, while the High scenario anticipates that just 10GW of onshore wind and solar PV is installed by 2030. This is considered the minimum forecast renewable capacity by a collection of industry experts.

The Power Generation dispatch model of Gas Networks Ireland considers various factors such as generator technical parameters, level of electrical interconnection between countries, and operational constraints on the transmission system.

- Technical parameters for generation plant have been modelled per CRU published values[44]. Where technical parameters were unavailable for new generator entrants, Gas Network's Ireland used either information made available directly from the plant developers or CRU published values for similar type and size plants.
- Existing interconnectors have also been modelled per CRU published values, but with the added inclusion of the North-South tie-line between ROI and NI, with the capacity between the two jurisdictions increasing almost threefold in 2028 with the completion of the North-South interconnector. The additional interconnector included in the Low scenario by 2031 is modelled based on existing interconnectors also per CRU published values.
- Technical operational constraints on the EirGrid system have been modelled per the existing EirGrid operational constraints[45].

In order to increase the RES-E share towards 80%, it is recognised that in addition to increasing installed renewable capacity, additional measures will be required to address existing technical constraints on the power system. To facilitate the capacity build-out profiles of renewable generation and achieve the 80% RES-E target (in particular in order to reduce the ensuing wind curtailment rates), EirGrid outlines the measures they intend to undertake in their Shaping Our Electricity Future Roadmap v1.1[46] and EirGrid Operational Policy Roadmap 2023-2030[47] publications. These measures include:

- Reduction or elimination of technical operational constraints on the transmission system;
- Reduction of thermal generator minimum-generation thresholds and the minimum inertia limit, thereby increasing headroom for renewable generation on days of high wind;
- Increasing the System Non-Synchronous Penetration (SNSP) level from existing 75% to 80% in 2024 and to 95% by 2030 in order to allow more penetration of non-synchronous resources (wind and solar) that would otherwise need to be curtailed; and
- Facilitation of wind export that may otherwise be curtailed on days of high wind, via electrical interconnection or alternative technologies.

Gas Networks Ireland assume that EirGrid implement these measures as per the timelines published, thereby minimising any limitation on increasing RES-E due to electricity grid operational constraints.

Considering both these operational measures and the renewable capacity build-out rates for each NDP scenario as outlined above, RES-E of 67%, 57% and 85% is achieved by 2030 in the Best Estimate, High and Low gas demand scenarios respectively. It is important to note that the Low and High NDP scenarios include EirGrid's Low and High electricity demand forecasts respectively. Hence, 85% RES-E is achievable based on low electricity demand and high installed renewable capacity while the High scenario indicates that just 57% RES-E is achievable where electricity demand is high and growth in renewable deployment is constrained.

By 2032, the Best Estimate forecasts RES-E of 77%, falling short of the 80% target by 3%, illustrating the challenge in meeting this target without sufficient renewable generation available. The Low and High scenarios project 91% and 58% RES-E in 2032 respectively.

The outlook to 2032/33 regarding the merit order in the SEM, as per Gas Networks Ireland's Power Generation gas demand forecasting model, is as follows:

- Renewables are assumed to be priority dispatch. These include Hydro, Wind, Solar PV and Biomass.
- Waste-to-Energy are also considered priority dispatch.

43 Decarbonised Electricity System Study (DESS) - SEAI
44 https://www.semcommittee.com/publications/sem-21-086-sem-plexos-model-validation-2021-2029-and-backcast-report
45 EirGrid Weekly Operational Constraints Update August 2024
46 Shaping Our Electricity Future Roadmap: Version 1.1 (eirgridgroup.com)
47 Operational Policy Roadmap 2023-2030

- In line with recent trends in electrical interconnector flow direction, it is anticipated that ROI will be net importing power in the Best Estimate scenario for the duration of the NDP horizon. The volume of net imports is expected to decline across the 10 years, with the introduction of the Carbon Border Adjustment Mechanism (CBAM) in January 2026 and the increase in indigenous renewable electricity production. In contrast, the High scenario forecasts strong net imports throughout the NDP horizon in order to meet high electricity demand and in the absence of high levels of renewables. The Low scenario projected ROI to be net-importing in the short-term (next 5 years) switching to strongly net exporting by year 10 due to low electricity demand and high penetration of renewables.
- Coal-fired generation remains competitive vs. gas-fired generation until July 2025 when the Moneypoint units are expected to no longer participate in the day-ahead and balancing electricity markets. Hence, coal is on a par with some less efficient gas-fired generation in the merit order based on futures prices and the additional benefit of being dispatchable at a very low capacity factor.
- Gas-fired plant is anticipated to meet the balance of electricity demand.
- Distillate-fired plant is dispatched extremely rarely to meet the balance of electricity demand on high electricity demand days.

Ireland's portfolio of CCGT power plants are significantly more efficient than other thermal generator types and provide the responsiveness and flexibility required to support wind generation and other renewables. Gas-fired generation accounted for 48% of Ireland's electricity generation fuel mix in 2023[48], illustrating it's critical role in ensuring electricity demand is met.

Figure 6-3 demonstrates the contribution of natural gas fired generation to the ROI electricity fuel mix for the 12 months up to September 2024. This figure illustrates how gas-fired power generation complements intermittent renewable sources. The partnership between these two is crucial for achieving Ireland's renewable integration goal.

48 https://www.seai.ie/data-and-insights/seai-statistics/monthly-energy-data/electricity/

Figure 6-3: Natural gas in the electricity fuel mix[49]

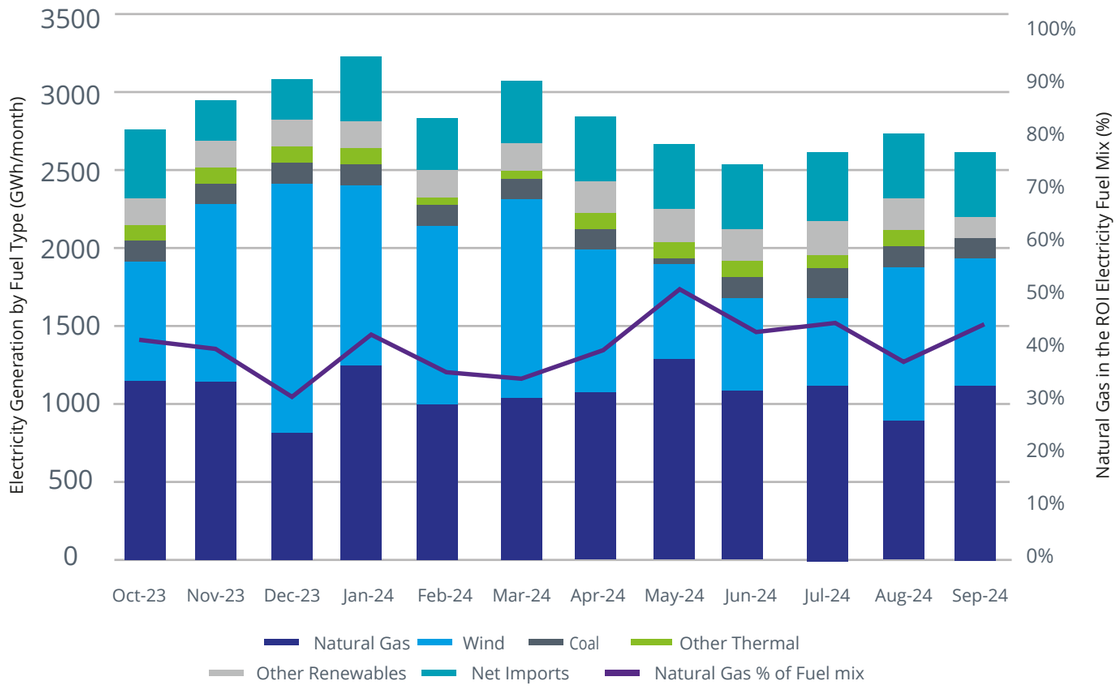
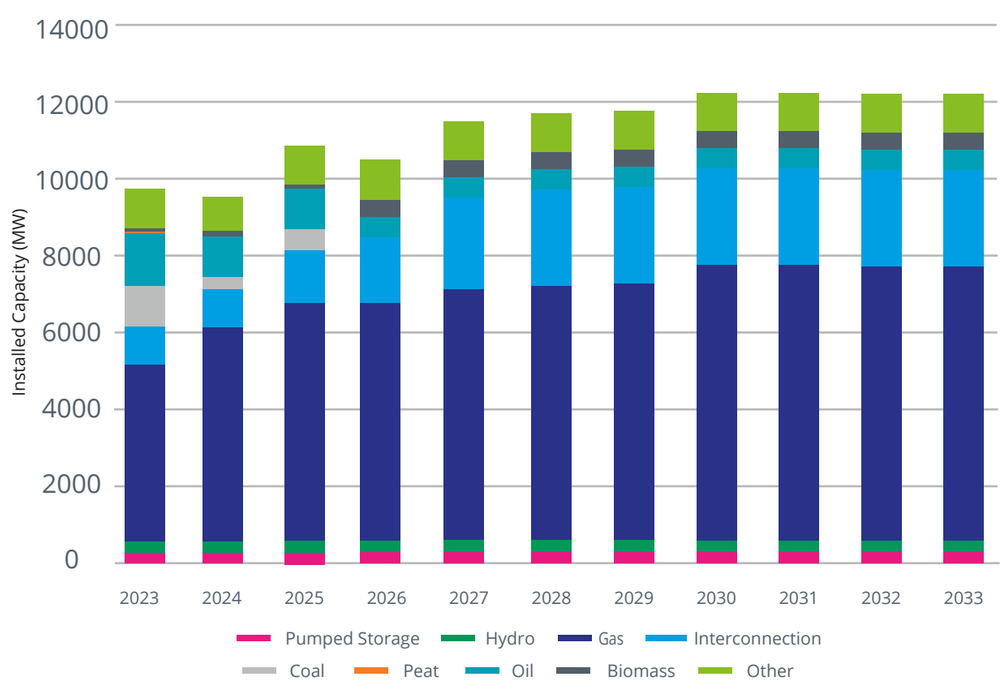


Figure 6-4 illustrates the forecast capacity of dispatchable plant in the SEM by fuel type, based on the EirGrid / SONI All-Island draft NRAA 2025-2034, and including any new dispatchable generation which has been successful in securing capacity as part of the T-3 and T-4 capacity auctions in recent years. This forecast is based on thermal plant capacities given for 2024, and anticipated decommissioning dates, as set out in the draft NRAA, with projected commissioning dates for newly qualified plant as per Gas Networks Ireland's timeline for connection to the gas network. (Note that the 'Other' category in Figure 6-3 includes Waste-to-Energy, Demand Side Units and Aggregated Generator Units)

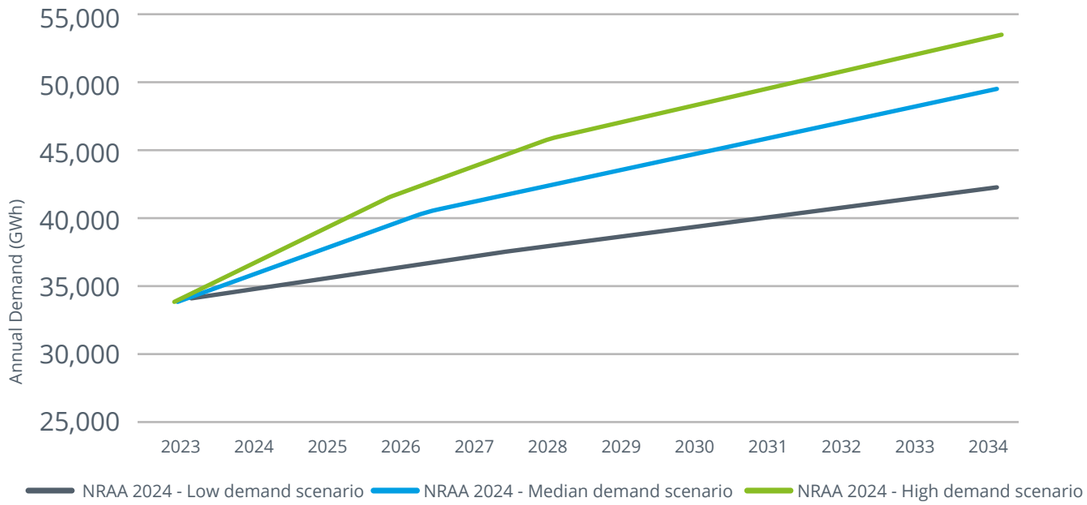
49 Based on SEAI Monthly Electricity Data https://www.seai.ie/data-and-insights/seai-statistics/monthly-energy-data/electricity/

Figure 6-4: Forecast Single Electricity Market (SEM) dispatchable generation mix and interconnection capacity



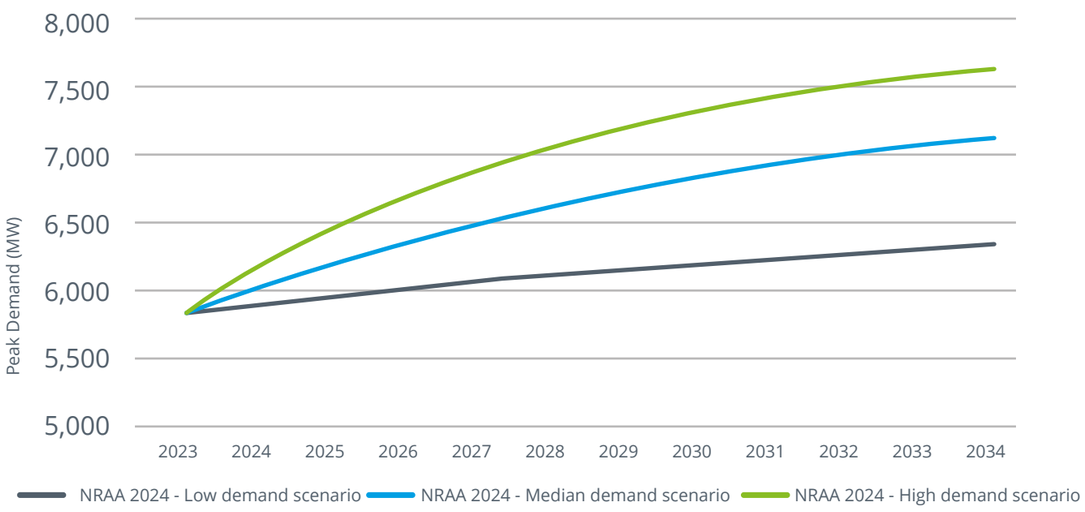
The EirGrid / SONI low, median and high annual electricity demand scenarios are illustrated in Figure 6-5. These electricity demand forecasts correspond to Gas Networks Ireland's Low, Best Estimate and High gas demand scenarios respectively, driving gas demand in the power generation sector.

Figure 6-5: Electricity demand forecasts for ROI



The Total Electricity Requirement (TER) peak demand from the draft NRAA 2025-2034 is shown in Figure 6-6 below and is used directly in forecasting the average winter peak gas demand day.

Figure 6-6: Peak electricity demand forecasts for ROI



For the 1-in-50 severe winter peak day projection, a calculated 1-in-50-year electricity demand is used, which considers the most recent actual '1-in-50' electricity peak of 5,090 MW, which occurred in 2010, the intervening peak day electricity growth rates, and the projected peak day electricity growth rates. This results in a factor being calculated, which when applied to the average winter peak day projection, gives a forecasted 1-in-50 peak electricity demand.

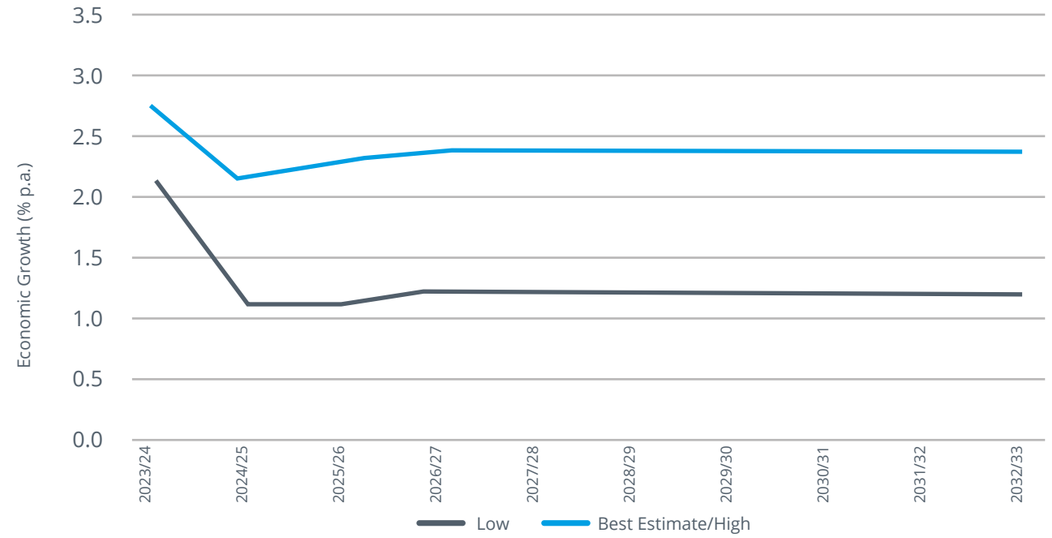
6.4.2. Industrial and commercial sector

Industrial & Commercial sector gas demand is assumed to increase across the NDP horizon in proportion with Modified Gross National Income (GNI*)[50] and in line with anticipated new connection numbers. This growth is partially offset by a forecasted decline in gas demand related to some existing I&C customers disconnecting from the network and others implementing energy efficiency measures. The number of disconnections is driven by the heat pump and district heating uptake by existing gas customers as alternative sources of heat.

Figure 6-7 presents the GNI* growth rate assumptions over the forecast period. The GNI* forecasts are a composite of a number of short-term forecasts from the International Monetary Fund (IMF)[51] and the Dept. of Finance[52], which are extended out in the medium-term across the NDP horizon for the Best Estimate and High gas demand scenarios. In the absence of a reasonable low GNI* forecast, the Low demand scenario medium-term economic growth projection is based on the GDP forecast from the ESRI's 2013 Medium Term Review (MTR) stagnation scenario.

50 Industrial & Commercial sector growth rate is assumed to be 80% of GNI* based on observed historical trends
51 2023 ARTICLE IV CONSULTATION
52 Dept. of Finance April 2024 Forecast

Figure 6-7: Economic growth assumptions



The Data Centre market continues to seek further growth opportunities in Ireland. New demand has sought to complement limited electricity grid connection capacity with on-site electricity generation, which may take the form of gas-fired generation coupled with a gas network connection. Using natural gas to generate electricity onsite provides additional flexibility for developers to alleviate demand from the electrical grid in times of low renewable generation penetration which mitigates putting further pressure on the electrical grid from an adequacy perspective.

The previous Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy set out a series of principles to inform and guide decisions on future Data Centre development. There is a clear preference for Data Centre developments that can demonstrate the additionality of their renewable energy use in Ireland and can demonstrate a clear pathway to decarbonise and ultimately provide net zero data services. Gas Networks Ireland believes that Data Centres connecting to the gas network could meet these principles through the increased use of biomethane and hydrogen while also assisting in establishing indigenous renewable gas markets in Ireland.

At the time of finalising this report, the proposed decision paper on Large Energy Users (LEU) connection policy was just published by the CRU which sets out a potential pathway for prospective LEU and data centre connection applications to the electricity grid. The CRU is not proposing to introduce any new decisions relating to connections to the gas network as part of the LEU policy review process. For the purposes of this NDP horizon, all scenarios include only those Data Centre customers with connection agreements already in place prior to the proposed LEU Connection Policy publication. These Data Centres customers with connection agreements already in place only represent a portion of the total enquiries received from Data Centres by Gas Networks Ireland to date. In future forecasts, Gas Networks Ireland will reassess the potential for any additional data centre connections.

If significant additional gas demand materialised, it would have a corresponding impact on NDP forecasts, and GNI may need to consider further measures to manage additional connections to the gas network in order to maintain security of supply, particularly during severe winter peak demand periods.

Table 6-2 presents the additional annual demand for large new connections in the Industrial & Commercial sector over the forecast period.

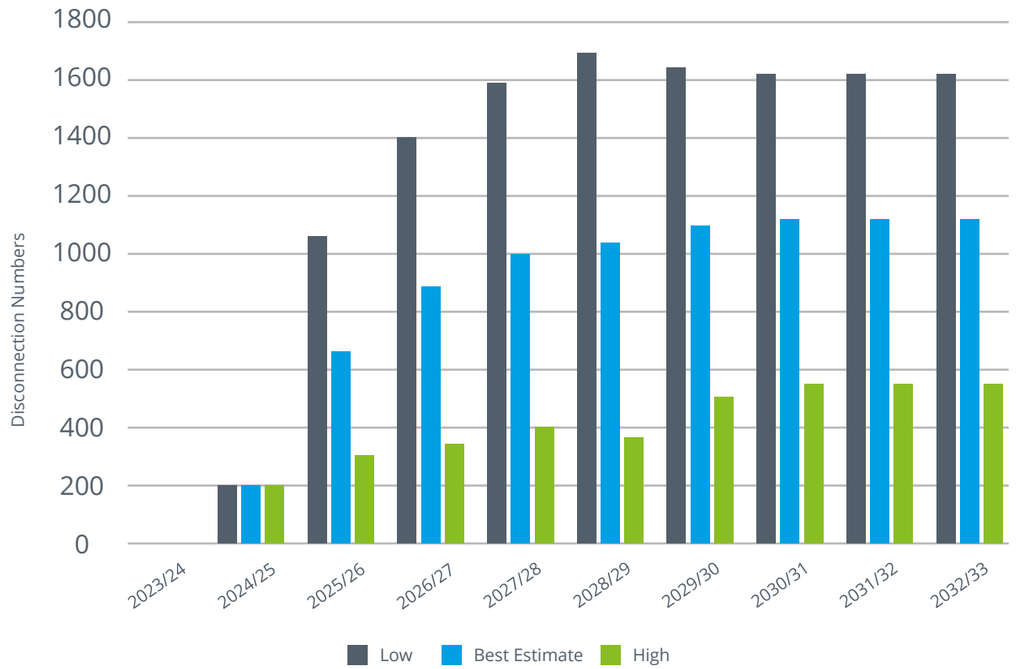
Table 6-2: Annual large new industrial & commercial load demand forecasts

GWh p.a.	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
All	94	299	973	1,363	1,521	1,618	1,668	1,818	2,018	2,218

Projected disconnections in the I&C sector partially offset the growth in gas demand due to increased economic activity and new Large Energy User connections. Disconnections (and their associated phasing) are informed by SEAI's With Existing Measures (WEM) and With Additional Measures (WAM) scenarios[53] which identify the potential no. of gas disconnections forecast due to the uptake of retrofits and carbon neutral heating technologies. The Low scenario includes the no. of gas disconnections identified in the WAM scenario, which are driven by the uptake of district heating and carbon neutral heating alongside the implementation of energy efficiency programmes. The High scenario includes the projected disconnections included the WEM scenario, which are largely driven by retrofitting and energy efficiency programmes. The Best Estimate models a midpoint between the WAM and WEM scenarios when determining the projected no. of gas disconnections.

Figure 6-8 below illustrates the combined projected no. of disconnections in the Industrial, Commercial and Public sectors.

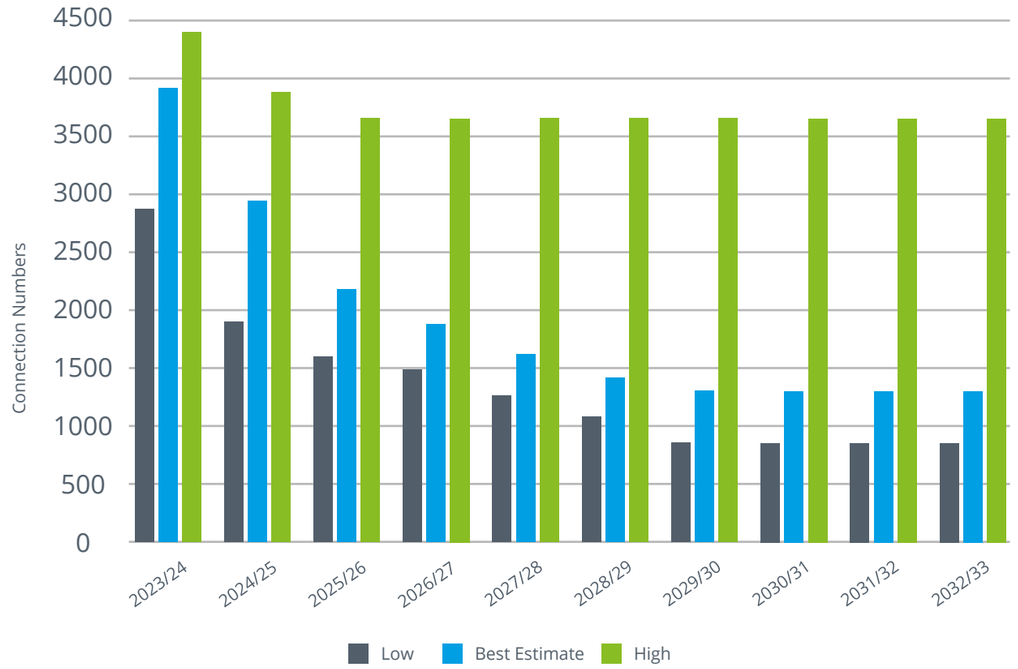
Figure 6-8: I&C disconnection numbers



6.4.3. Residential sector

The forecast for new residential connections is shown in Figure 6-9[54]. The Government's Climate Action Plan 2021, and subsequent updates (CAP 2023 and CAP 2024), proposed an effective ban on the installation of natural gas boilers in new homes from 2023. All new housing developments are now being designed with electrical heating solutions, e.g. heat pumps, and without a natural gas supply. However, conversion of existing oil or solid fuel heating systems to natural gas in the mature housing stock are still permitted, are low intervention solutions and can provide an immediate reduction in emissions. Apartments may continue to be developed with natural gas central boiler solutions and potentially Combined Heat and Power (CHP) technology, many of which are designed to be district heating compatible. Gas Networks Ireland will continue to support the building and developer community with natural gas solutions for existing dwellings and will promote renewable gases as a pathway for these existing homes to decarbonise.

Figure 6-9: Residential new connection numbers



Gas Networks Ireland has incorporated the CAP 2024 targets for the electrification of heat and the deployment of district technology into our Best Estimate, Low and High scenarios to varying degrees.
The plan targets:

1. An additional 680,000 heat pumps in residential buildings by 2030, of which 400,000 are to be installed in existing buildings and;

2. A target for the built environment of 2.7TWh of installed district heating capacity by 2030, 1.2TWh of which Gas Networks Ireland has assumed will be targeted to be provided by the residential sector, in line with the SEAI assumptions as part of their WAM scenario.

Currently gas boilers represent approximately a 28% share of primary energy source by building stock[55]. Gas Networks Ireland advocate prioritising the most carbon intensive and the least efficient sources of residential heating (i.e. oil, solid fuel and electric (non-heat pump)), for replacement with heat pumps first, with switching from natural gas being the next preference. The Best Estimate scenario assumes that by 2030, 75% of the CAP 2024 targets related to installation of heat pumps in existing houses will be met. The ramp up in gas disconnections required is significant and results in c. 66,000 cumulative residential gas customer disconnections by 2030 for the uptake of heat pumps. It is assumed that the heat pump adoption rate continues at a similar trajectory beyond 2030, with c. 115,500 cumulative disconnections by 2032/33. The Low scenario assumes that 100% of the heat pump target for existing dwellings is met while the High gas

53 Ireland's Greenhouse Gas Emissions Projections 2023-2050

54 On average a central boiler will service 167 apartment units. The connection numbers shown in Figure 6-8 include new houses, mature houses and apartment units

55 Heating and Cooling in Ireland Today | National Heat Study | SEAI

demand scenario assumes that the uptake of heat pumps in existing dwellings is in line with the SEAI WEM scenario.

In Irish climate policy, significant deployment of district heating is planned as a key technology vector for decarbonisation of Ireland's residential heating sector. Realising this potential is dependent on whether it can be delivered at a cost, scale and speed that is competitive against alternative options. CAP 2024 includes a target for the built environment of 2.7TWh of installed district heating capacity by 2030, 1.2TWh of which Gas Networks Ireland has assumed will be targeted to be provided by the residential sector, in line with SEAI assumptions[56]. To date, only two district heating schemes are being developed, with a projected combined production of 0.07 TWh by 2030. In the Best Estimate, it is assumed that 75% of the district heating target is met on time and that existing natural gas customers switching to district heat account for 28% of the target, in line with current percentage share of primary energy source by building stock. This results in a total of c. 33,400 gas disconnections by 2030, rising to c. 58,400 by 2032/33. The Low gas demand scenario assumes that 100% of the district heating target is met while the High gas demand scenario assumes that the uptake of district heating schemes out to 2030 is limited to the projects currently in development/completed to date.

The forecast for total non-cumulative residential disconnections, which includes a projection of business as usual disconnections which are not specifically CAP-related, is shown in Figure 6-10.

With significant numbers of gas customers forecast to disconnect from the network over the coming 10-year period, Gas Networks Ireland will reassess our infrastructure on a case-by-case basis to determine if gas assets are to be repurposed or to be decommissioned if they are no longer in use.

6.4.4. Energy efficiency

Energy efficiency savings impacting on residential, industrial and commercial gas demands are derived from potential average savings identified in the SEAI National Heat Study[57]. Energy efficiency savings in the residential gas demand sector consider the type of dwelling and the average potential savings identified by dwelling type. Similarly, savings in the I&C sector due to energy efficiency measures examine current demand by sub-sector and apply the average potential savings identified by the Study. It is assumed that 50% of Gas Networks Ireland's existing customers in both the Residential and Industrial and Commercial sectors achieve these average energy efficiency savings by 2030, and that the trajectory of these savings continues at the same pace for the final three years of the NDP horizon, out to 2032/33.

The recast Energy Efficiency Directive (EU) 2023/1791[58] was published in the EU Official Journal in September 2023, taking effect on the 3rd of October 2023. EU Member States have two years to transpose this Directive into national law.

The Directive establishes an EU energy efficiency target of 11.7% for 2030. It requires EU Member States to collectively ensure an additional reduction of final and primary energy consumption, compared with energy consumption forecasts made in 2020. EU countries will be required to achieve new savings of 1.3% of final energy consumption p.a. to 2025, rising to 1.5% p.a. to 2027, and increasing further to 1.9% p.a. to 2030 and beyond. This is up from the current target of 0.8% p.a.

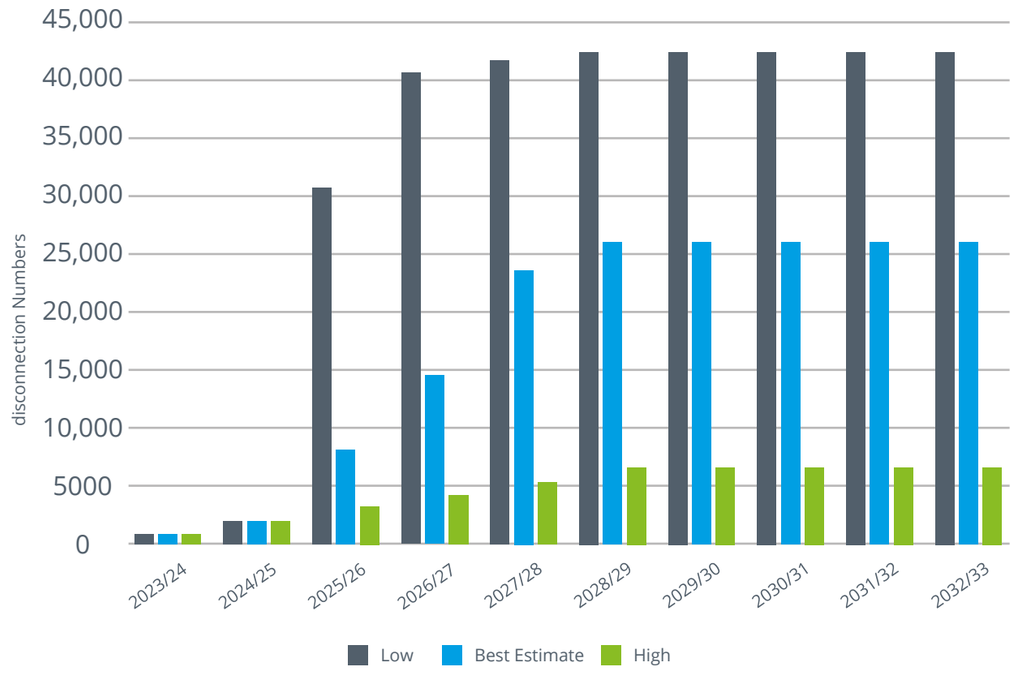
Once the Directive is adopted into National Policy, Gas Networks Ireland will fully assess the implications for gas demand across the different sectors and include the associated targets in the three NDP scenarios accordingly. The current level of energy efficiencies applied to existing Industrial & Commercial customers in this NDP is estimated to be 50% of the energy efficiency target to be set under the Directive while the energy efficiency savings included in the NDP for the Residential sector is approx. 30% of that which is set out in the Directive.

56 Ireland's Greenhouse Gas Emissions Projections 2023-2050

57 https://www.seai.ie/publications/Heating-and-Cooling-in-Ireland-Today.pdf

58 Directive (EU) 2023/... of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (europa.eu)

Figure 6-10: Residential disconnection numbers



6.4.5. Transport sector

The gas demand forecast also includes projected demand for the Transport sector. This forecast relates to the development of Compressed Natural Gas (CNG) within the transport industry through the uptake of CNG vehicles. CNG is particularly suitable for heavy goods vehicles (HGVs), providing an economically advantageous alternative to electric solutions. There are currently almost 170 CNG HGV vehicles operating across the country, with the majority of these vehicles operating on BioCNG (i.e. CNG formed from renewable gas, e.g. biomethane), some of which is purchased from the Cush Injection facility in Co. Kildare and some imported from other jurisdictions. The growth in Bio-CNG usage contributes towards the decarbonisation of the commercial transport sector, which is responsible for up to 20% of the country's transport emissions.

Gas Networks Ireland is developing a nationwide CNG fuelling network, some co-located in existing fuel forecourts, and others, particularly those delivered in 2024, located on dedicated CNG sites, on major routes and/or close to urban centres. To date, Gas Networks Ireland has delivered a total of eleven fast-fill CNG stations, eight public and three private, with one further public station at final stage of completion, due to be opened early in 2025. Gas Networks Ireland has opened three new fast-fill CNG stations in 2024 alone, at Keelings in Swords (June), Junction 14 on the M7 motorway in Kildare (September) and Panda/Beauparc Ballymount in south Dublin (October).

The delivery of private CNG refuelling stations represents another element of Gas Networks Ireland's wider CNG strategy. Gas Networks Ireland delivers CNG infrastructure to private fleet operators and hauliers, allowing those who require more control over their refuelling patterns to do so in their own locations. There are currently three private CNG stations operational in Ireland. These are located at Gas Networks Ireland's Gasworks Road site in Cork, Clean Ireland Recycling's site in Shannon and Virginia International Logistics site in Ballycoolin, Dublin.

The recent growth in the number of CNG stations is in response to the increasing demand for renewable gas in Ireland's transport sector. From January 2023 to August 2024, gas consumption in transport has seen significant month-on-month (MoM) and year-on-year (YoY) growth, demonstrating a shift towards cleaner fuel alternatives as Ireland moves to decarbonise its commercial transport sector. In particular, 2024 has seen a consistent increase in YoY growth. February saw an 11% increase YoY, while April's usage was up 42% YoY. This upward trend continued into the summer months, with YoY gas usage increases reaching 65% in July and 80% in August.

As part of the NDP Best Estimate projections, it is assumed that a total of 21 Public CNG stations will be operational by 2033. Annual CNG demand of c. 360GWh p.a. is forecast when the CNG station portfolio has reached its anticipated operating capacity.

Utilising bio-CNG to power HGVs, offers a real solution to decarbonising the HGV fleet. Biomethane in transport can contribute to the achievement of Ireland's emissions reduction targets and targets for the use of renewable energy in Transport. Climate Action Plan 2023 supports the development of Project Causeway and Green Connect CNG refuelling infrastructure in action "TR/23/65". Progress on this action is already evident, with the Causeway Project nearing completion, almost 170 CNG vehicles on the road, refuelling infrastructure operational and indigenous biomethane being injected into the national gas network.

When powered 100% by bio-CNG, this equates to c. 65 ktonneCO2-eq annual savings in the Best Estimate scenario when the CNG stations reach their anticipated capacity.

The High scenario assumes that 71 CNG stations will be operational by the end of 2033, resulting in savings of c. 210 ktonneCO2-eq p.a. when supplied by bio-CNG. Table 6-3 gives the projected transport sector demand for each scenario.

Table 6-3: Annual CNG demand forecasts

GWh p.a.	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33
Low	26	34	50	85	140	225	288	306	324	342
Best Estimate	26	34	50	85	140	225	288	306	324	342
High	26	60	95	250	480	684	810	918	1,044	1,152

6.5. The demand outlook

This section presents an overview of the gas demand outlook for the period 2023/24 to 2032/33.

6.5.1. Power generation sector gas demand

The previous decade has broadly seen increased Power Generation sector gas demand driven by growing electricity demand alongside coal-, peat- and oil-fired generators either falling in the merit order and/or retiring from service.

Electrical interconnector behaviour generally operates efficiently in that the interconnectors are mainly importing to Ireland when Irish electricity prices are higher than GB markets and exporting at times of high wind when prices in the SEM are lower than in GB[59]. Imports to ROI in 2023/24 have far out-weighed exports due primarily to the electricity price differential with GB, boosted by the fact that GB carbon prices have been at a significant discount to EU ETS prices since mid-2023. This rise in electrical imports has directly displaced gas-fired generation in 2023/24, resulting in a decrease in gas demand of 8% compared to 2022/23.

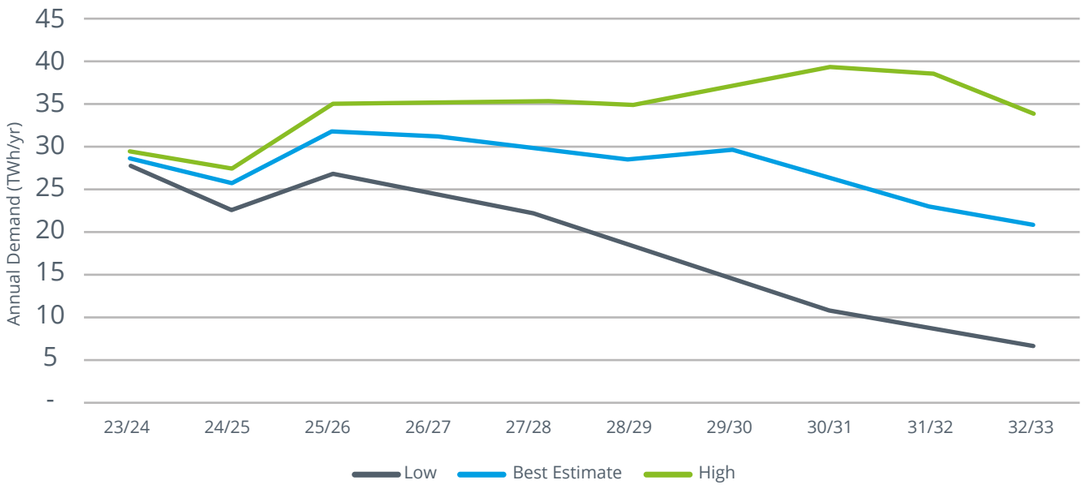
The forecasted net import/export position for ROI is dependent on both futures fuel prices and on the renewable capacity trajectory in each NDP scenario. In the short- to medium-term, it is anticipated that ROI will remain in a net-import position in all three NDP scenarios.

59 SEM committee Single Electricity Market Performance Quarterly Reports, available at https://www.semcommittee.com/publications

With the addition of two new interconnectors during the NDP period, connecting Ireland to France via the Celtic interconnector and Ireland to Wales via the Greenlink interconnector, it is anticipated that Ireland will remain net-importing in both the Best Estimate and High gas demand scenarios throughout the NDP horizon. This is dependent on good nuclear availability within the French electricity grid, which would support an export position from France to neighbouring jurisdictions. Future interconnector flows between Ireland and GB are more unpredictable, given that the Carbon Border Adjustment Mechanism (CBAM) is due to come into force in January 2026 and it is not yet known how significant the effect on imports to Ireland will be a result. With the increased penetration of renewable power on the island toward the end of the NDP horizon, it is envisaged that the SEM will be net exporting for the second half of the NDP horizon (from 2028/29) onwards in the Low scenario.

Figure 6-11 below illustrates the trajectory of annual gas demand in the power generation sector for each of the three NDP scenarios.

Figure 6-11: Power generation sector gas demand



In the Best Estimate demand scenario, Power Generation sector annual gas demand is expected to decrease by 27% across the NDP horizon. The key driver of this projected decrease is the forecast growth in installed renewable capacity, directly displacing annual gas demand. The model includes EirGrid's latest forecast of wind and solar generation build-out rates where, in total, installed renewable capacities are projected to reach c. 14.8GW by 2030, increasing to 19.5GW by the end of the NDP horizon. This is in contrast to the forecast installed renewable capacity of 17.5MW and 22GW for 2030 and 2032 respectively included in NDP 2023, which was the driver of a projected 47% decrease in gas demand for the power sector in that report. Renewable capacity build-out rates have been revised down to reflect the challenges facing the delivery of onshore and offshore wind projects in particular, e.g. in securing planning permission. As a result, the Best Estimate results in a RES-E of 67% by 2030, falling short of the 80% target identified in the CAP 2024 update. Some operational constraints on the electricity grid have been relaxed, in line with EirGrid's Operational Policy Roadmap 2023-2030, resulting in less gas-fired generation being constrained on by the end of the decade, however, there is not sufficient renewable generation available to reach the 80% target. While RES-E in the Best Estimate is forecast to increase to 74% and 77% in 2031 and 2032 respectively, driven by increasing renewable capacity, the magnitude of the increase in wind and solar capacity is not sufficient to meet 80% RES-E.

With the Greenlink interconnector becoming operational in 2025, it is forecast that gas demand will decrease by 9% in 2024/25 vs. 2023/24, if the trend in high net imports from GB continues over the coming year. Gas demand in the power sector bounces back in 2025/26 with the forecast increase in electricity demand and with the introduction of the CBAM, making GB imports less competitive. From 2026/27 onwards, power generation gas demand decreases once more with the commissioning and operation of the Celtic interconnector in 2027, and the ramp up in renewable capacity.

The fall in gas demand is in contrast to the strong growth in electricity demand with EirGrid predicting growth of 42% between 2023 and 2033 in their median electricity demand scenario. As previously mentioned, the penetration of renewable generation and relaxation of operational constraints, coupled with the impact of increased interconnection with GB and France, is, for the most part, offsetting any growth in gas demand for Power Generation due to this increased electricity demand.

The High demand scenario uses similar inputs and assumptions, with the exception of the following:

- taking EirGrid High electricity demand forecast and;
- slower renewable generation capacity roll-out, with 12.9GW of capacity installed by 2033, compared to 19.5GW in the Best Estimate scenario.

Power generation gas demand in the High demand scenario is projected to increase by 16% across the NDP horizon. The combination of high electricity demand and low renewable capacity build-out results in a RES-E of just 57% by 2030, rising to just 58% by 2032.

The Low demand scenario inputs and assumptions deviate from the Best Estimate scenario as follows:

- taking EirGrid Low electricity demand forecast;
- faster build-out rate of new renewable installed capacity, with 26.8GW installed by 2033, and an accelerated build-out of solar PV vs. both the Best Estimate and High scenarios;
- one further electrical interconnector connecting Ireland and GB operational in 2031 (750MW capacity)

Power generation gas demand in the Low demand scenario is projected to decrease by 75% across the NDP horizon. RES-E of 85% is forecast for 2030, increasing to c. 91% in 2032.

6.5.2. Industrial and commercial sector gas demand

In the Industrial and Commercial sector, both the Best Estimate and High scenarios are forecasting growth across the NDP period of 11% and 19% respectively, as illustrated in Figure 6-11 below. In contrast, in the Low demand scenario, Industrial & Commercial sector gas demand is expected to decrease by 4% by 2032/33.

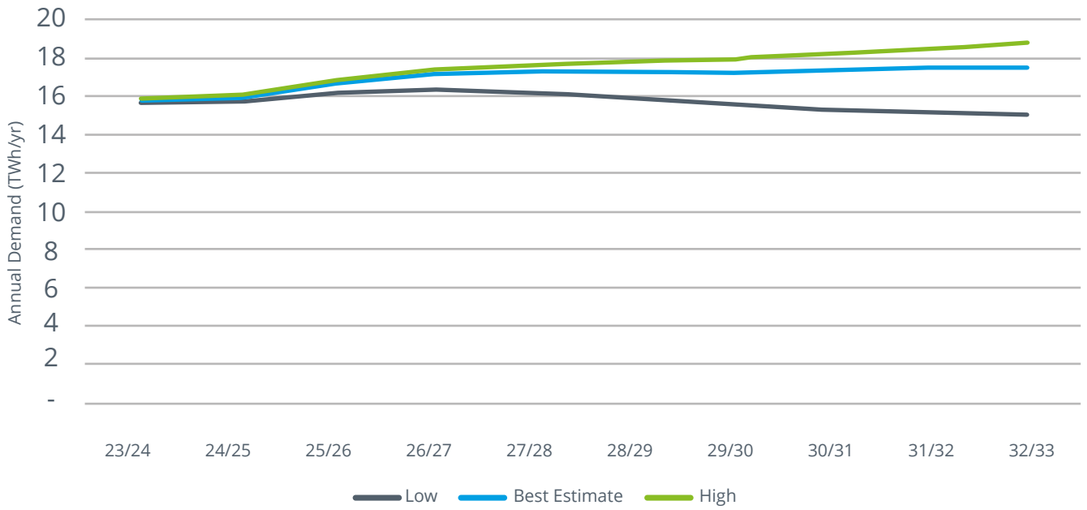
Anticipated growth in this sector is linked to economic performance; as noted in Section 6.3, moderate GNI* growth is assumed in the short to medium-term in all scenarios. The Best Estimate and High scenarios forecast GNI* growth of 2.4% p.a. on average across the NDP period. In the Low scenario, a more modest economic growth projection is applied of 1.3% p.a. on average across the 10-year horizon.

In addition to GNI* growth, an increase in the projected number of additional (one-off) connections from Large Energy Users is also driving growth in the Industrial and Commercial sector.

Forecast growth in the I/C sector as mentioned above would be partially offset by the following:

- The adoption of energy efficiency measures as described in Section 6.3;
- Disconnection of gas customers from the network in the I/C sector due to uptake of either heat pumps or district heating schemes as alternative sources of heat. These disconnections relate to Non-Daily Metered (NDM) customers who typically use gas for space heating and/or low grade heating processes.

Figure 6-12: Industrial & commercial sector gas demand

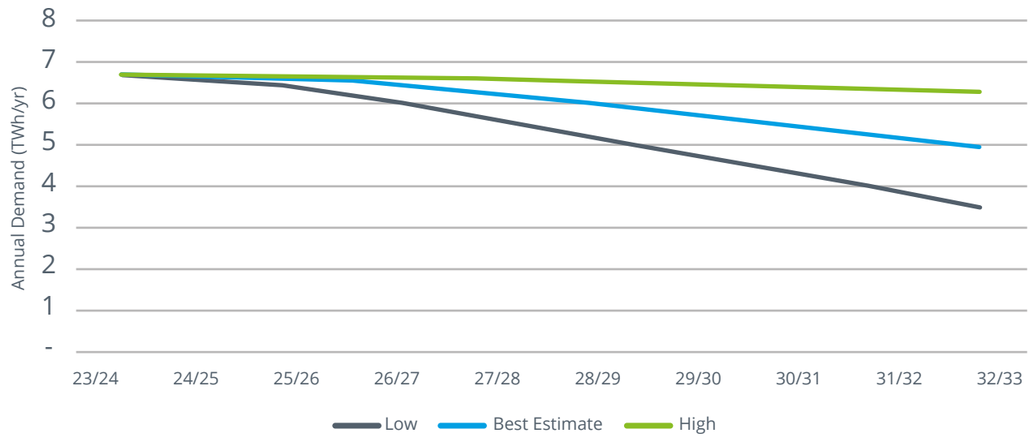


6.5.3. Residential sector gas demand

In the Residential sector, a contraction in demand is projected across all scenarios, as illustrated in Figure 6-13 below. This is as a result of declining new connection numbers, coupled with an anticipated increase in disconnection rates in this sector as a result of a migration of residential heating systems to heat pumps and district heating at scale. Energy efficiency improvements in existing dwellings are also expected to reduce residential gas demand in all three scenarios, as referenced above in section 6.3.

The Best Estimate scenario projects a reduction of 26% in the Residential gas demand sector across the forecast horizon. In the High and Low demand scenarios, 6% and 47% reductions in demand are predicted respectively.

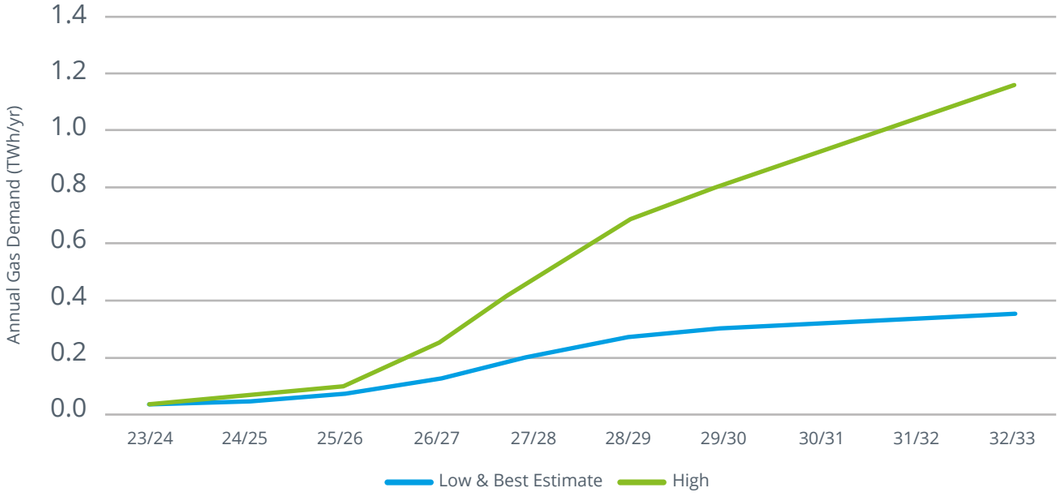
Figure 6-13: Residential sector gas demand



6.5.4. Transport sector gas demand

In the Transport sector, growth is projected across all scenarios, as shown in Figure 6-14 below. Gas Networks Ireland has successfully developed both public and private bioCNG stations on the distribution gas network. The NDP forecasts growth in the number of new CNG stations across the 10-year NDP period. The growth trajectory in this sector remains similar to NDP 2023 projections; demand of c. 360 GWh/yr is expected in 2032/33 in both the Low and Best Estimate NDP 2024 scenarios. The High scenario forecasts demand of c. 1,150 GWh/yr in 2032/33.

Figure 6-14: Transport sector gas demand



6.5.5. Total annual gas demand

In the Best Estimate demand scenario, annual ROI gas demand is expected to fall by 14% between 2023/24 and 2032/33. In the Low demand scenario, a decrease in ROI gas demand is predicted over the same horizon of 49% while an increase in annual gas demand of 16% is projected in the High demand scenario. The decrease in the Best Estimate and the Low scenarios is driven by the anticipated fall in both Power Generation and Residential sector gas demands, offsetting any growth in the Industrial and Commercial sector. In contrast, growth in Power Generation and Industrial & Commercial demand contributes to the increase in demand in the High scenario.

The aggregate ROI demands for the three NDP scenarios are presented in Figure 6-15. Figure 6-16 gives the breakdown of each sector over the forecast period for the Best Estimate demand scenario.

Figure 6-15: Total annual ROI gas demands

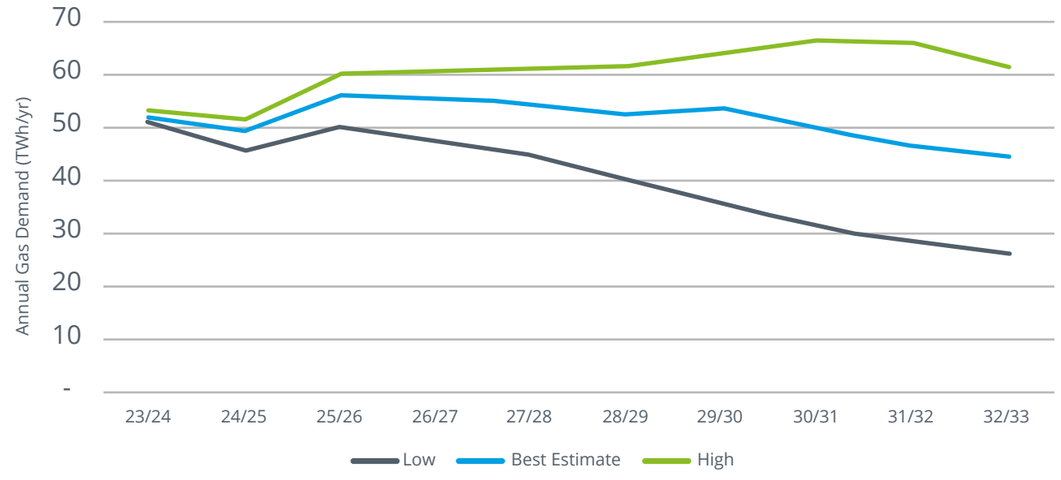
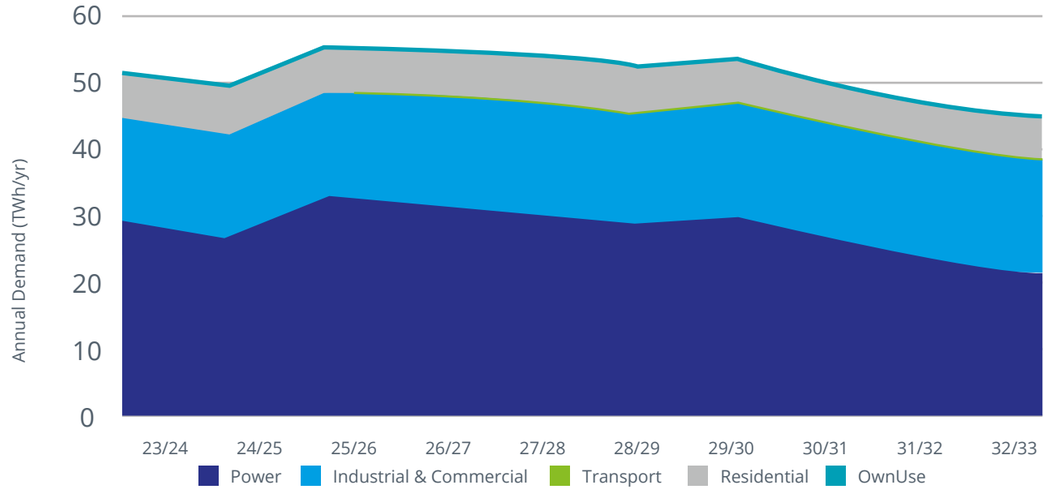


Figure 6-16: Best estimate scenario annual ROI demand by sector



6.5.6. Peak day gas demand

The 1-in-50 and average year peak day gas demands for ROI are given in Figure 6-17 and Figure 6-18 respectively. The 1-in-50 peak day gas demand is expected to grow across the 10-year NDP horizon by 6% in the Best Estimate and 26% in the High demand scenarios, while the Low is expected to decline by 14%. Average winter peak day demands are expected to grow by 6% and 22% in the Best Estimate and High demand scenarios respectively and fall by 11% in the Low scenario.

Figure 6-17: ROI 1-in-50 winter peak day gas demand forecast

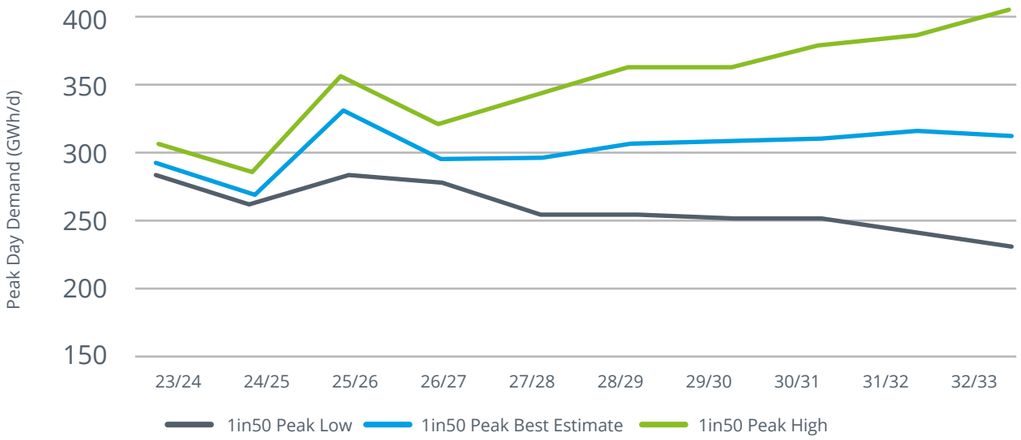
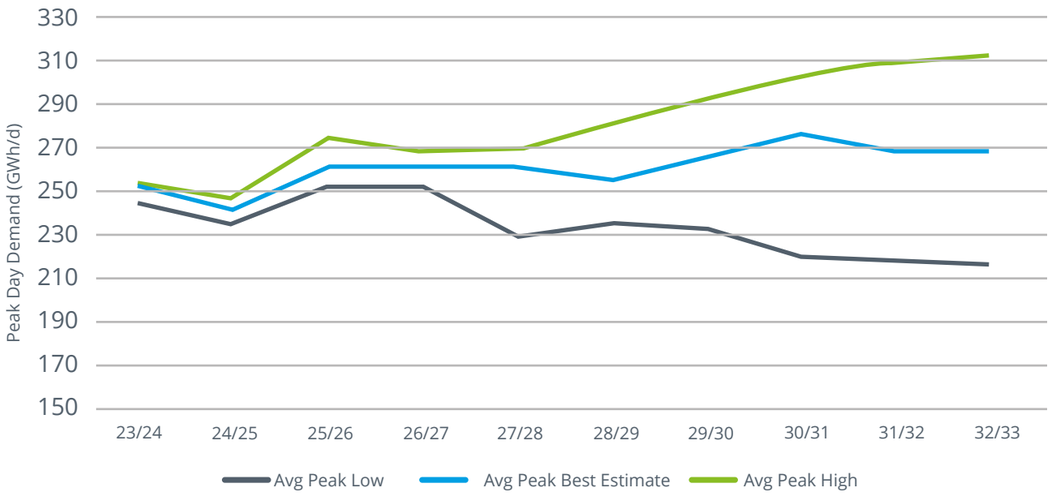


Figure 6-18: ROI average winter peak day gas demand forecast



The annual and peak day gas demand forecasts are decoupled as a result of the changing landscape of the power generation sector. Annual gas demand projections are impacted by the increased roll-out of renewable generation and the availability of electricity imports, which directly displaces dispatchable thermal generation, e.g. gas-fired generation, when available. In contrast, the peak gas demand day is most likely to coincide with low non-dispatchable renewable generation, i.e. wind. Consequently, there is a high dependency on thermal generation, particularly gas-fired generation, to meet the high levels of electricity demand which occur during such calm weather periods. Furthermore, based on historic weather data (from the 1982 to 2019 inclusive), there is a strong correlation between very low wind availability and 1-in-50 cold temperatures. Hence, the gas demand peak day is modelled with very low wind availability coupled with negative ambient temperatures.

Hence, the gas demand peak day is modelled with very low wind availability coupled with negative ambient temperatures.

Another reason for the growth in peak day gas demand is related to forecast growth in peak electricity demand, which is expected to grow by 23% across the NDP time horizon[60] . Hence, gas-fired electricity generation is both compensating for low renewable generation on the peak day for gas demand while also meeting the growing peak electricity demand year-on-year.

The high level of electrical interconnection achieved by 2027 also has an impact on the power generation peak day gas demand; in the forecast, the SEM is anticipated to be net importing on these days, thereby displacing some of the OCGTs that would have been the marginal plants in the merit order. It is noted that the direction of interconnector flow is entirely dependent on market conditions at a given time. In reality, the availability of imports on the peak day may be restricted if, for example, there is low nuclear availability in France, or France and/or GB simultaneously experience peak day conditions (i.e. low renewable availability, cold temperatures and high electricity demand). In order to ensure that there is not an over-reliance on interconnection on the peak day, all electricity interconnectors have been derated to 70% of their maximum capacities. This factor is informed by discussions with the electricity TSO, EirGrid regarding the availability of interconnector imports during times of high regional electricity demand. Given that the Best Estimate 1-in-50 peak day forecast demand is taken as the level to which the gas network system supply capacity is intended to be designed, Gas Network's Ireland deem it prudent that the risk of electrical interconnection being limited, to some extent, is taken into account in the base case.

In addition to restricted interconnector availability, there is also the possibility that an interconnector may be fully unavailable or on outage on the peak gas demand day. Hence, a sensitivity is included below which examines the Best Estimate forecast in the event of the largest electricity interconnector being unavailable on the 1-in-50 peak day. This is in addition to the 70% derating as outlined above; it is assumed that the remaining operational interconnectors are not available to ramp up from 70% to 100% to meet the shortfall in electricity supply in this sensitivity.

The forecasted increase in peak day demand, despite the anticipated decrease in annual demand, results in a requirement for Gas Networks Ireland to assess how the operation of the network is likely to change in the future, given that gas demand may fluctuate from day-to-day by greater margins. This is already becoming evident during periods where wind conditions change abruptly, causing a significant swing in the daily gas demand for power generation.

6.5.7. Peak day sensitivity

A sensitivity (Sensitivity 1) was identified and carried out on the Best Estimate 1-in-50 winter peak day scenario examining the case where the largest installed interconnector is unavailable for imports to the SEM on the peak day. In the base case Best Estimate, on the peak day, ROI is forecasted to be net importing electricity to meet demand. However, as previously outlined, it is possible that interconnector imports may not be fully available on the peak day depending on market conditions and/or possible interconnector outages. This sensitivity quantifies the peak day gas demand forecast in the event of an outage on the largest piece of electricity interconnector infrastructure, with the remaining interconnectors still derated to 70% as per the base case scenario. 70% as per the base case scenario.

60 Draft EirGrid and SONI National Resource Adequacy Assessment 2025 - 2034

Table 6-4 shows the results of the Sensitivity in terms of growth in the ROI 1-in-50 peak day demand

Table 6-4: Sensitivity analysis results vs. Best Estimate (Base Case)

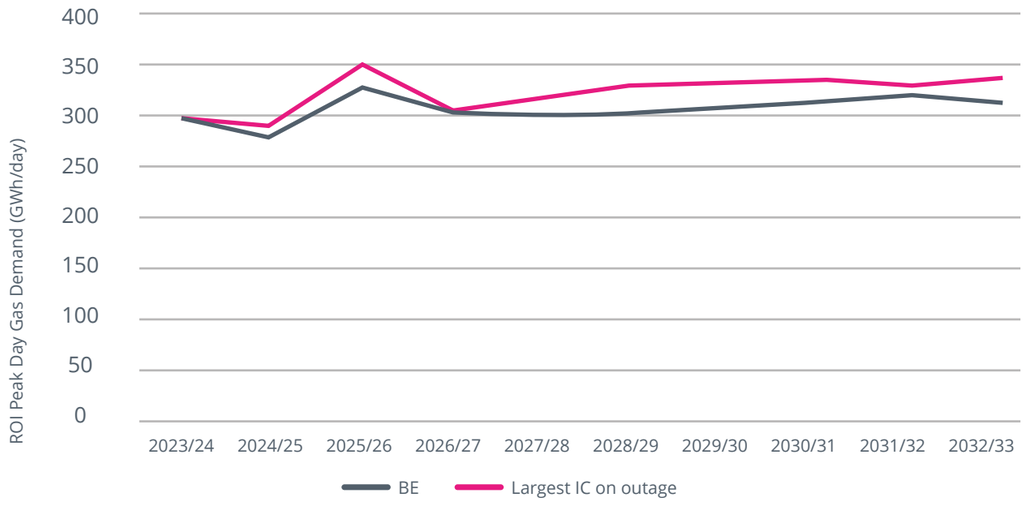
Scenario	2023/24 -> Peak Year in Horizon i.e. 2025/26 (% Growth) (ROI 1-in-50 Peak Day)	vs. Base Case	2023/24 -> 2032/33 (% Growth) (ROI 1-in-50 Peak Day)	vs. Base Case
Base Case: Best Estimate	11%		6%	
Sensitivity 1: Best Estimate with largest electricity interconnector excluded	19%	↑	14%	↑

Overall, ROI 1-in-50 peak day gas demand grows by 14% in comparison to growth of 6% in the base case Best Estimate scenario. Furthermore, the highest peak demand day across the whole NDP horizon occurs in 2025/26 in the base case, exhibiting growth of 11% vs. year 1 of the forecast, 2023/24. In this sensitivity, that growth increases to 19% between 2023/24 and 2025/26.

In the base case Best Estimate 1-in-50 peak day forecast, there are considerable imports to ROI on the peak day, providing up to 36GWh electricity on the peak day by 2032/33. As gas-fired generators are typically the marginal plant, these electricity imports have a direct dampening effect on gas demand for power generation.

A comparison between ROI 1-in-50 peak day demand for the base case Best Estimate and Sensitivity 1 is shown in Figure 6-19 below, which illustrates the impact of the largest available interconnector being on outage on the peak day, resulting in a direct increase to gas demand across the NDP horizon. The increase in gas demand on the peak day is up to 26GWh during the 10-year period.

Figure 6-19: ROI 1-in-50 Peak day demand for the base case Best Estimate vs. Sensitivity 1



6.5.8. Carbon emissions

Ireland's carbon budget programme, comprising three legally binding 5-year budgets covering periods out to 2035 came into effect in April 2022. The budgets are further broken down into sectoral emissions ceilings[61], namely for the electricity, transport, built environment, industry, LULUCF[62] and agriculture sectors, with reductions in emissions ranging from 25% to 75% per sector by 2030, relative to 2018 emission levels, as outlined in Figure 6-20.

Figure 6-20: Sectoral emission ceilings

	2018 Baseline (MtCO2eq.)[1]	Sectoral Emission Ceilings for each 5 year carbon budget period (MtCO2eq.)		Indicative Emissions in Final Year of 2021 - 2025 carbon budget period (MtCO2eq.)	Indicative Reduction in Emissions in Final Year of 2021 - 2025 budget period compared to 2018	Emissions in Final Year of 2026 - 2030 carbon budget period (MtCO2eq.)	Reduction in Emissions for Final Year of 2026 - 2030 carbon budget period compared to 2018	Agreed CAP21 Ranges
Sector	2018	2021 - 2025	2026 - 2030	2025	2025	2030	2030	2030
Electricity	10	40	20	6	~40%	3	~75%	60 - 80%
Transport	12	54	37	10	~20%	6	~50%	40 - 50%
Built Environment - Residential	7	29	23	5	~20%	4	~40%	45 - 55%
Built Environment - Commercial	2	7	5	1	~20%	1	~45%	
Industry	7	30	24	6	~20%	4	~35%	30 - 40%
Agriculture	23	106	96	20	~10%	17.25	~25%	20 - 30%
LULUCF[2]	5	xxx	xxx	xxx	xxx	xxx	xxx	40 - 60%
Other (F-Gases, Waste & Petroleum refining)	2	9	8	2	~25%	1	~50%	N/A
Unallocated Savings			-26			-5.25		
Total[3]	68	xxx	xxx	xxx	xxx	xxx	xxx	N/A
Legally binding Carbon Budgets and 2010 Emission Reduction Targets[4]	-	295	200	-	-	34	51%	-
Annual unallocated Emission Savings in 2030			5.25[5]					
Unallocated Savings 2026 - 2030[6]			26					

[1] Million tonnes of carbon dioxide equivalent

[2] Finalising the sectoral emissions ceiling for the LULUCF sector has been deferred for up to 18 months from July 2022 to allow for the completion of the Land-use Review

[3] Following finalisation of the sectoral emissions ceilings for the LULUCF sector, 5-year economy-wide total figures will be available

[4] As provided by section 6A(5) of the Climate Action and Low Carbon Development (Amendment) Act 2021

[5] Unallocated savings on an economy-wide basis in 2030 (final year of second carbon budget period), before factoring in net LULUCF sector emissions[6] Unallocated savings on an economy-wide basis in the second 5-year carbon budget period from 2026 - 2030, before factoring in net LULUCF / sector emissions

61 At the time of writing, the sectoral emission ceilings for the third budget (2031-2035 incl.) have yet to be announced.

62 Land Use, Land Use Change and Forestry

Gas Networks Ireland recognises the importance of these targets as a method of reducing the use of carbon intensive fuels and in promoting the uptake of energy efficiency measures.

The NDP models include the following energy systems:

1. The whole electricity system, including forecast generation by all fuel types;
2. Gas demand only (i.e. natural gas, biomethane and Hydrogen) for the Residential, Industrial and Commercial and Transport[63] sectors.

Hence, it is possible for Gas Networks Ireland to quantify the total forecast emissions related to the electricity network and compare these to the carbon budgets and annual targets for the Electricity sector. However, when considering the other sectors and their carbon emission budgets and limits, Gas Networks Ireland can only calculate the forecast contribution from networked gas-related emissions as the whole energy system, and the associated fuels consumed, are not explicitly modelled.

Table 6-5 below compares the carbon budget targets (for 2025 and 2030) and carbon budget 2 limit (2026-2030 incl.) for the following sectors:

1. Electricity (all fuels)
2. Built Environment – Residential (gas only)
3. Built Environment - Commercial and Industry (gas only)

All projected emissions take into account the carbon emissions offset from using renewable gases where available, which are assumed to have zero emission factors. The allocation of renewable gas to each sector is consistent with the CAP 2024 targets for renewable gases for 2030 as follows:

- 0.7TWh renewable gas for residential heating
- 0.4TWh renewable gas for commercial buildings
- At least 2.1TWh of zero emission gas for industrial heating

Where the availability of renewable gas exceeds the limits for these sectors, the remaining renewable gas is firstly attributed to Gas Networks Ireland's own gas demand use, and then the remainder is allocated to the Electricity sector. In our forecasts, renewable gas is assumed to offset future demand associated with existing customers connected to the gas network.

63 All gas consumed in the Transport sector is assumed to be renewable, i.e. it has a zero emission factor

Table 6-5: Sectoral carbon emission targets and budgets vs. forecast emissions by sector for NDP scenarios

	2025	2030	2026 - 2030
Electricity	**Mtonne CO_2**	**Mtonne CO_2**	**Mtonne CO_2**
Target	6	3	20
Low	4.7	2.6	19.4
Best Estimate	5.5	5.4	28.2
High	5.8	6.9	33.4
Industrial & Commercial			
Target[64]	7	5	29
Low	2.9	2.6	14.1
Best Estimate	2.9	2.7	14.5
High	2.9	2.8	14.9
Residential			
Target[65]	5	4	23
Low	1.2	0.8	4.8
Best Estimate	1.2	0.9	5.3
High	1.2	1.0	5.7

The following conclusions can be drawn for these forecast sectoral emissions:

- In the Best Estimate, both the 2030 target and 2026-2030 limit for Electricity-related emissions are exceeded by 80% and 41% respectively. This is in large part due to the RES-E hitting 67% in 2030, rather than the CAP target of 80%.
- The Low scenario meets the 2030 target and 2026-2030 limit for Electricity-related emissions. RES-E in the Low scenario in 2030 is 85%, which is achieved based on low electricity demand and high renewable capacity build-out. Hence, this scenario illustrates the criteria needed in order to get close to meeting the challenging Electricity sector carbon targets.
- As regards the Industrial and Commercial sectors, in the Best Estimate, 2030 emissions relating to networked gas reach 2.7 Mtonnes (54% of the target) while 2026-2030 cumulative emissions reach 14.5 Mtonnes (50% of the target). The contribution from other fuels towards this target has not been included as previously mentioned.
- As regards Residential demand sector, in the Best Estimate, 2030 emissions reach 0.9 Mtonnes (23% of the target) while 2026-2030 cumulative emissions reach 14.5 Mtonnes (also 23% of the target). The contribution from other fuels towards this target has also not been included.

Finally, Figure 6-21 below illustrates the projected total carbon emissions from the ROI gas network across the 10-year NDP horizon. Again, the forecasts account for emissions savings resulting from displacing natural gas use with biomethane and hydrogen. Details of the annual supply forecast are included in Section 7.

64 Individual carbon budget targets and limits for the Built Environment – Commercial and Industry sectors have been amalgamated here to report on emissions from Industrial and Commercial gas demand collectively

65 Industrial & Commercial and Residential targets are stated for all fuels. Only the contribution from natural gas demand is shown in carbon emissions for the Low, Best Estimate and High scenarios for these sectors.

Figure 6-21: ROI forecast annual carbon emissions from the gas network

The Best Estimate scenario is projecting a 33% decrease in carbon emissions relating to gas demand supplied by the gas network by 2032/33 relative to 2023/24. The Low and High gas demand scenarios forecast a 56% and 2.4% decrease in gas network associated carbon emissions.

6.5.9. Gas Networks Ireland's decarbonisation plan

Gas Networks Ireland is taking steps to decarbonise how we operate our transportation business while facilitating the network's transition to renewable gases. Working groups are established to assess and implement emission reduction initiatives across the business. In 2023 Gas Networks Ireland received an A- in the CDP (Carbon Disclosure Project) submission, which is in the Leadership band. This is higher than the Europe regional average of B, and higher than the Energy utility networks sector average of B. We also received an A- in our Supplier Engagement Rating. In addition, we are signatories of the Low Carbon Pledge, a Business in the Community Ireland (BITCI) initiative for Irish businesses to invest time and resources into creating a more sustainable operation, by being more energy efficient and reducing carbon usage. As part of this pledge we have a commitment and plan to reduce carbon emission intensity by 50% by 2030.

Gas Networks Ireland's direct emissions fall into three categories: Scope 1, Scope 2 & Scope 3. The following summarises three categories and the ongoing and planned initiatives in order to reduce our operational GHG emissions intensity by 50% by 2030.

Scope 1:
Operational fuel gas consumption and / or gas losses (both fugitive and from essential venting) generates the vast majority of our overall emissions. Gas transported via the Moffat Entry Point requires the use of compression facilities at Beattock and Brighouse Bay in order to raise the pressure of the gas for onward transportation to Northern Ireland, Isle of Man and the Republic of Ireland and to maintain pressures throughout the system. We plan to further reduce and improve reporting of fugitive emissions (ongoing), increase own use of biomethane for gas heating, reduce operational venting (ongoing, including recompression units installation in our compressor stations by 2027) and investigate the potential for installing and integrating electric drive compressors operating on renewable electricity to the existing compressor stations in Scotland (consideration for 2030 onwards).

Scope 2:
Our electricity consumption including the electricity used for our offices, for pressure reduction and for compressor stations on our network. We have made significant progress towards reducing our Scope 2 emissions. We recently completed a refurbishment of our headquarters in Cork and sustainability considerations (energy efficiency and resource management) are central to the upgraded design. We are also targeting operational installations to be more energy efficient. Our office and fleet performance are tracked by the Sustainable Energy Authority of Ireland (SEAI). We have a number of targets to meet by 2030 including a reduction of 50% in GHG emissions.

Scope 3:
Scope 3 emissions are those that result from activities not owned or directly controlled by the company but that the company indirectly impacts in its value chain. This includes emissions from sources such as business travel, waste disposal, and purchased goods and services. These can vary each year depending on the amount of pipeline laid in a year or the emissions reported by our main contractors. Gas Networks Ireland's main third-party contracts have been designed to deliver sustainability and environmental best practice throughout the relevant project's lifecycle. This includes KPIs related to waste reduction, carbon and energy emissions, and biodiversity enhancements. We plan to reduce these emissions through better sustainable procurement and stronger supplier management.

7. Gas supply

Key Messages:

- The Corrib gas field met 22% of ROI demand (16% of annual Gas Networks Ireland system demand) in 2023/24, with the Moffat Entry Point providing the remaining 78%.
- The Corrib gas field supplied approximately 12% of ROI peak day demand (9% of Gas Networks Ireland peak system demand) in 2023/24.
- The Moffat Entry Point in Scotland will remain key in terms of energy security as Corrib production declines across the NDP horizon.
- Moffat is anticipated to meet 91% and 87% of Gas Networks Ireland ROI and system peak day demands respectively in 2032/33.
- Biomethane is forecast to meet 17.7% of ROI annual demand and 7.8% of ROI peak day demand in 2032/33. This is based on achieving 7.9 TWh/yr of indigenous biomethane by the end of the NDP period.
- The NDP forecast includes hydrogen blends in the network of 3.3% of annual system demand by 2032/33 in the Best Estimate, supplied both indigenously and through the interconnectors with GB.

This section presents an overview of the gas supply outlook for the period 2023/2024 to 2032/33.

7.1 Annual gas supply

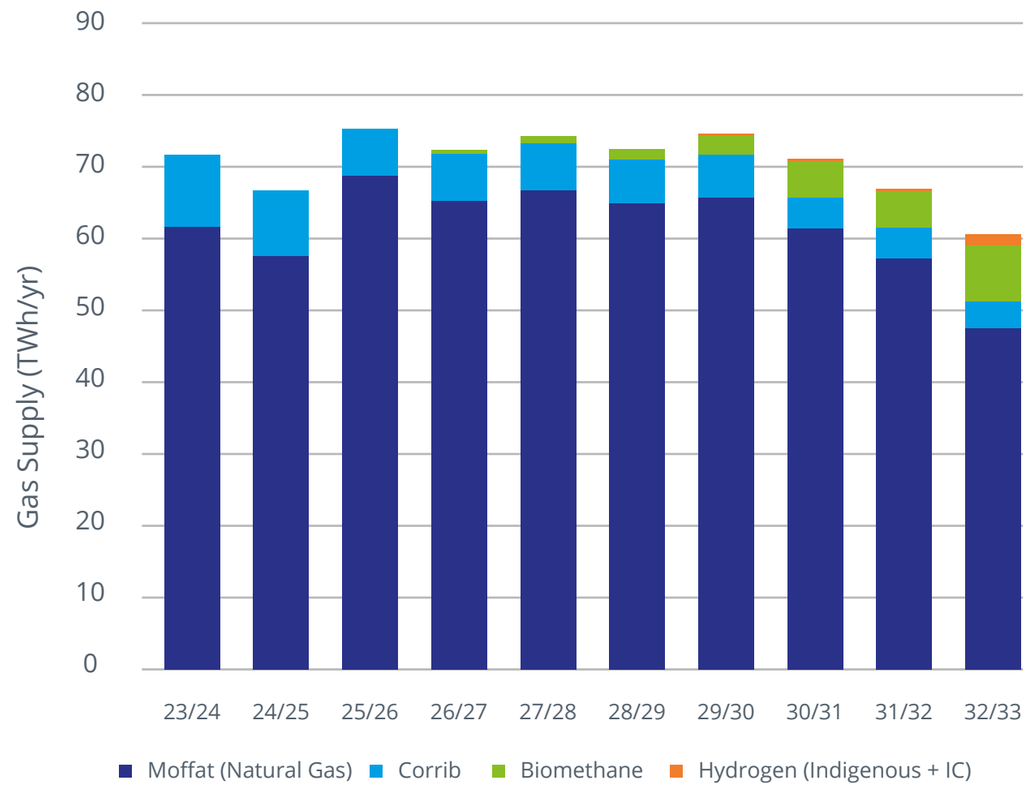
For 2023/24, the Corrib gas field met 22% of ROI demand (16% of annual Gas Networks Ireland system demand), with the Moffat Entry Point providing the remaining 78% (84% of system demand). Biomethane provided less than 0.1% of demand, totalling 48GWh.

In the future, Corrib is projected to decline in its share of supply; by 2032/33, Corrib is expected to account for just 8% of ROI annual demand (6% of annual system demand). Moffat is projected to account for 70.4% of ROI demand, of which 0.7% is imported hydrogen, by the end of the NDP horizon (78.5% of annual Gas Networks Ireland system demand).

Renewable gases, i.e. biomethane and hydrogen, are anticipated to play a larger role in system supply by 2032/33 and will offset the decline in indigenous gas supply from Corrib. Biomethane supply is forecast to meet 17.7% of ROI demand while hydrogen is projected to meet 4.3% of ROI demand, 15% of which through Moffat via blends of 2% by volume. (3.3% of system demand, 20% of which is supplied through Moffat).

Figure 7-1 presents the forecast Gas Networks Ireland system annual gas supply for the period to 2032/33 for the Best Estimate demand scenario.

Figure 7-1: Annual Gas Networks Ireland system gas supply forecasts – Best Estimate scenario



7.2. Peak day gas supply

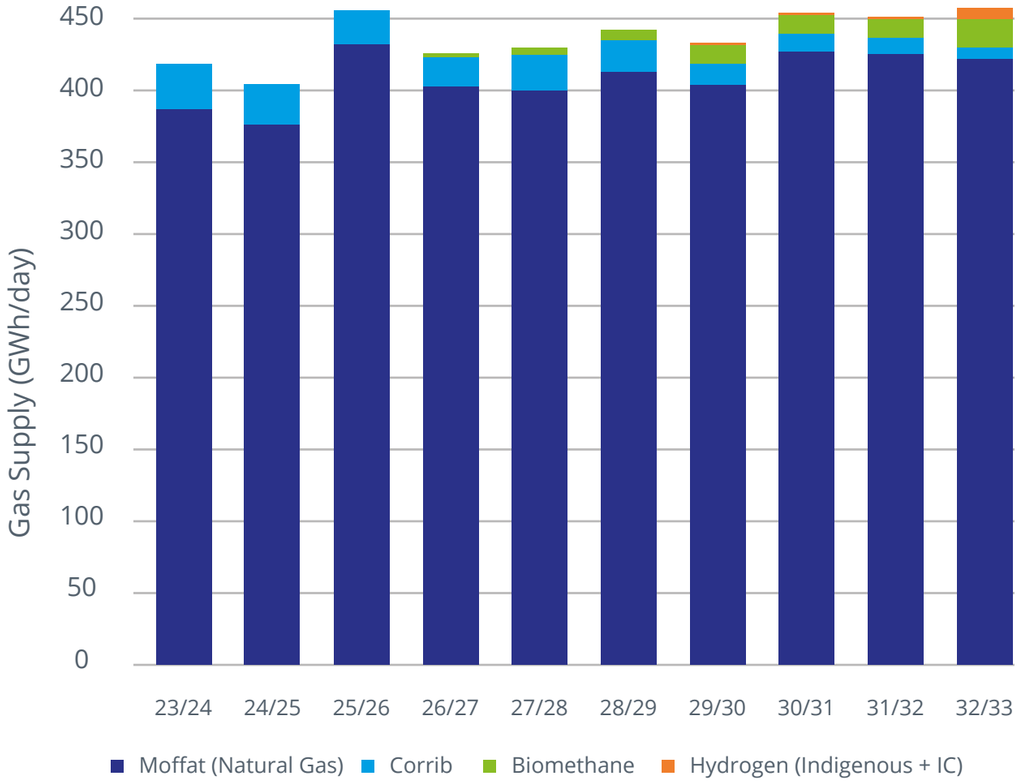
The Corrib gas field supplied approximately 12% of ROI peak day demand (9% of Gas Networks Ireland system peak day demand) in 2023/24 with the balance of ROI demand of 88% met via imports from Moffat (91% of system demand).

Moffat is anticipated to meet 91% and 87% of Gas Networks Ireland and ROI system peak day demands respectively in 2032/33.

Biomethane is forecast to meet 7.8% of ROI peak day demand by 2032/33 while hydrogen is forecast to meet 1.7% of ROI demand, 15% of which through Moffat (1.2% of system peak day demand, 20% of which is supplied through Moffat). The balance of peak day supply is forecast to be met by Corrib, contributing 3.5% and 2.4% to ROI peak day and Gas Networks Ireland system demands respectively.

The gas supply outlook highlights the continued critical role of the Moffat Entry Point throughout the forecast period. It is noted that based on the Best Estimate projection, the current technical entry capacity at the Moffat Entry Point (386.9 GWh/d) would be exceeded on a 1-in-50 peak day in the last eight years of the forecast horizon. A series of capacity upgrade works at both compressor stations in Scotland are being progressed to meet the forecasted 1-in-50 peak day demands. These are discussed in further detail within Section 10.

Figure 7-2: 1-in-50 Peak day Gas Networks Ireland system gas supply forecast– Best Estimate scenario



7.3. Moffat entry point

The Moffat Entry point in southwest Scotland supplies gas to ROI, NI and IOM. The Moffat Entry Point has reliably met the systems energy demand requirements for Ireland since the construction and commissioning of the first interconnector (IC1) in 1993. This connection to the GB National Transmission System (NTS) facilitates Ireland's participation in an integrated European energy market. Shippers active in the wholesale gas market in ROI are also typically active in the GB market or have access via contractual arrangements with upstream counterparties. The UK wholesale gas market is extremely liquid with diverse supply sources including indigenous production, imports from Norway and mainland Europe, and LNG imports from worldwide sources. Wholesale supply contracts into the ROI market are for variable duration and volumes because much of the demand in ROI is related to the Power Generation market.

Hydrogen blending at Moffat is a distinct possibility before 2030 pending ongoing consultation with National Gas. Hence, the NDP supply forecasts include a blend of 2% hydrogen by volume at Moffat from 2030 onwards.

7.4. Corrib gas

The Corrib gas field, following commencement of production in December 2015 and a subsequent period operating at full capacity, reached a production plateau at the beginning of 2018. A steady decline in production has been observed at Corrib since then, in line with supply profile projections as detailed in previous Network Development Plans. Table 7-1 shows the forecast maximum daily supplies from Corrib received in June 2024.

Table 7-1: Corrib forecasts maximum daily supply

	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Maximum Daily Supply (mscm/d)	3.2	3.2	2.7	2.4	2.1	1.8	1.7	1.5	1.3	1.1
Maximum Daily Supply (GWh/d)	33.8	33.5	28.2	25.6	22.3	19.4	17.6	15.3	13.7	11.7

7.5. Biomethane

Energy from biomethane has the potential to contribute significantly to Ireland's renewable energy targets. In particular, biomethane could greatly assist Ireland in meeting the EU targets for thermal energy from renewables (RES-H) and transport fuel from renewables (RES-T). In addition to being a potentially carbon neutral fuel, biomethane production can also deliver significant greenhouse gas mitigations for the Agriculture sector, with elimination of Green House Gas (GHG) emissions from current slurry storage, slurry land spreading practices, and crop residue emissions.

As with other renewable energy technologies, biomethane requires national policy and incentive supports to allow the industry to develop and grow to a long-term competitive fuel. With the pending implementation of an appropriate support mechanism (i.e. the Renewable Heat Obligation), Gas Networks Ireland has produced three biomethane gas production scenarios (Low, Best Estimate and High).

As mentioned previously in Section 4.1, both national policy, directly in the CAP 2024, and EU policy, indirectly in the form of a collective EU biomethane target in RePowerEU, support a target of 5.7TWh of biomethane production by 2030. This target is further supported by the sectoral greenhouse gas emissions ceilings incorporated into the CAP 2024. Specifically, CAP 2024 identifies the following targets for 2030 for the use of renewable gas:

- Renewable gas for residential heating of 0.7TWh
- Renewable gas for commercial buildings of 0.4TWh
- At least 2.1 TWh of zero emission gas for industrial heating

This allocation by sector is factored into the three NDP scenarios insofar as is possible. The Best Estimate and High scenarios meet these targets while the Low scenario does not meet them until 2032/33. In both the Best Estimate and

High gas demand scenarios, it is assumed that growth of the biomethane industry continues beyond achieving the 5.7TWh target. This assumption is supported by studies showing the availability of feedstock for the production of biomethane beyond 5.7TWh, including research papers[66] and the Biomethane Energy Report published by Gas Networks Ireland in 2023[67] following an RFI (Request for information).

The High gas demand scenario almost reaches the total biomethane target of 5.7TWh, with 5.4TWh of biomethane production expected by 2030. The target of 5.7 TWh is exceeded in 2031 and 2032 with forecast production of 6.9TWh and 8.2TWh respectively.

The Best Estimate scenario assumes that the infrastructure is in place to support the 5.7TWh target by the end of 2030, but it is 2031 before production of 5.7TWh is realised. This trajectory reflects the volume of biomethane production plants that need to be built and connected to the gas network in the next 6 years to support the growth of the biomethane industry.

The Low scenario considers a further delay to the infrastructure being put in place to meet the 5.7TWh target, with production of only 1.5TWh expected by 2030, increasing to 3TWh by 2032.

Table 7-2 below summaries Gas Networks Ireland's biomethane production forecast. The growth trajectory varies in each scenario depending on the pace at which the biomethane industry develops to meet the 5.7TWh government target, e.g. the timing and magnitude of support offered by the Renewable Heat Obligation incentivising accelerated or delayed biomethane demand.

Table 7-2: Biomethane gas supply forecast

TWh/yr	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Low	0.1	0.1	0.2	0.3	0.5	0.9	1.4	2.1	2.9	3.6
Best Estimate	0.1	0.1	0.3	0.7	1.4	2.5	3.8	5.4	6.5	7.9
High	0.1	0.2	0.5	1.1	2.1	3.4	4.9	6.5	7.8	9.2

7.6 Hydrogen

Gas Networks Ireland welcomes new sources of gas supply and is actively engaging with prospective renewable hydrogen producers on their connection enquiries. Gas Networks Ireland has an excellent track record in delivering infrastructure projects and will continue to engage with renewable energy developers to explore the opportunities and challenges presented by future injection of hydrogen into the gas network.

As outlined in Section 4, looking beyond 2030, the gas network can be fully decarbonised by utilising biomethane and hydrogen. In the interim it is likely that hydrogen will begin to enter the network within the forecast horizon of the NDP, in low blended volumes on the Transmission gas network and with the potential for higher blends in parts of the Distribution gas network. It is possible that 100% hydrogen clusters based around large hydrogen customers may also begin to emerge within the period of the NDP.

The publication of the REPowerEU Plan in May 2022 confirmed the EU's plans to end its dependency on Russian fossil fuels through energy saving and diversification of supplies and to accelerate the roll-out of renewable energy. The Plan includes a target of producing 10 million tonnes of domestic renewable hydrogen plus 10 million tonnes of hydrogen imports by 2030.

66 Alternative energy management strategies for large industry in non-gas-grid regions using on-farm biomethane - ScienceDirect

67 Biomethane Energy Report

Both the CAP and the National Hydrogen Strategy include a target of 2GW of offshore wind for off electricity grid applications such as the production of green hydrogen to be in development by 2030, with a level of the hydrogen produced anticipated to be transported in a dedicated hydrogen network separate to the existing gas network. Gas Networks Ireland do not foresee the full 2GW of dedicated offshore wind being available by 2033 and instead assume that 20%, 35% and 50% of this target is reached in the Low, Best Estimate and High supply scenarios respectively. The NDP forecasts include the following Hydrogen supply sources:

- A blend of hydrogen in the supply via the interconnectors with GB of 2% by volume[68] of annual system demand by 2030.
- A range of indigenous production via electrolysis across the Best Estimate, Low and High scenarios from:
  - Surplus renewable generation from onshore renewables
  - Dedicated offshore wind farms (from 2033)

Table 7-3 below outlines the projected hydrogen supply forecast for ROI for each of the three NDP scenarios.

TWh/yr	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Low	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	1.0
Best Estimate	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.5	1.9
High	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.7	0.7	2.8

68 This assumption is informed by discussions between Gas Networks Ireland and National Gas. It is possible that blends may be supplied as early as 2028, and, operationally, Gas Networks Ireland are working towards this assumption. Hence, the approach used in the NDP could be considered conservative.

8. Gas customer evolution

Key Messages:

- The gas network continues to play an important role in Ireland's economy, delivering over 30% of the country's primary energy needs[69], serving homes, businesses and electricity generation. In total, there are c. 716,000 gas customers in Ireland[70].
- Gas Networks Ireland plans to fully decarbonise the Irish gas network by 2050 to ensure it continues to serve Ireland's energy needs while also playing a significant role in supporting Ireland's climate change and emissions targets.
- The evolution of the gas network to the point of full decarbonisation will develop over the coming 25 years and across a set of distinct phases. Over the next ten years, the network will continue to predominantly transport natural gas, with the volume of renewable gases in the network set to increase year-on-year.
- In 2023, almost half (47%) of total electricity produced in Ireland was generated using natural gas. Gas-fired generation provides essential dispatchable energy to meet demand surges and provide back-up flexibility for the electricity grid particularly when renewable sources of electricity are not available, an increasingly important capability as the share of renewable electricity generation continues to grow.
- The industrial and commercial sectors in Ireland rely heavily on networked gas with 31% of final energy coming from the gas network in 2022. Renewable gas provides these sectors with a pathway to decarbonisation.
- Gas Networks Ireland currently provides a safe, reliable and secure supply of natural gas to almost 690,000 residential customers throughout Ireland. Home energy efficiency measures and a higher uptake of heat pumps and deployment of district heating schemes will see a decline in gas demand in the domestic sector over the NDP period.
- Combining networked gas with district heating technology, CHP and other renewable technologies has proven to be an effective energy solution for multi-occupancy buildings and apartment block developments and these options may be explored as policy develops over the NDP period.
- There are currently twelve bioCNG stations in operation in ROI (nine Public and three Private) with nine further public and private stations projected across the NDP period.
- Biomethane injection into the gas network totalled 60GWh in 2023, injected via the Cush Entry Point in Co. Kildare. In 2024, construction began on a centralised injection point in Mitchelstown Co. Cork. The NDP forecasts significant growth in this sector, with 5.7TWh of biomethane supply forecast by the end of 2031, a delay of just one year compared to the Government's Climate Action target of 5.7 TWh by 2030. Following the publication of the National Biomethane Strategy in May 2024, Gas Networks Ireland await the announcement of the Renewable Heat Obligation scheme, which is seen as a key enabler of growth in the production of biomethane out to 2030 and beyond.

69 Energy-in-Ireland-2023.pdf (seai.ie)
70 As at the start of November 2024

Ireland's gas network is among the most modern in Europe and it provides a safe, secure and reliable energy supply. Our national gas network infrastructure is 14,725km long and connects towns and villages in 22 counties across the country. The gas network is a substantial core component of Irish electricity generation with just under half of total electricity produced in Ireland in 2023 generated using natural gas. Gas-fired generation provides essential dispatchable energy to meet demand surges and provide back-up flexibility for the electricity grid when renewable sources of electricity are not available, an increasingly important capability as renewable electricity generation continues to grow. The capacity and reliability of the gas network means it can continue delivering energy to customers and provide additional fuel for electricity generation when required.

The energy density of natural gas means it is uniquely placed to serve the needs of high-heat processing and heavy-load transportation. Natural gas provides a cleaner alternative to coal, peat, oil and diesel and replacing these fuels with natural gas or compressed natural gas can provide immediate emissions reduction. By transporting increasing volumes of renewable gases (biomethane and green hydrogen) in the network, as these become available, the gas network will realise even greater emissions savings over time. Bio-Compressed Natural Gas (bioCNG) is a carbon neutral fuel that can be used to decarbonise parts of the transport sector. BioCNG is biomethane that has been compressed and stored in a gas vehicle's storage tank and it is particularly suitable for use in commercial vehicles where electric solutions are not always a viable option.

8.1. Electricity sector

The electricity sector in Ireland is facing a dual challenge of decarbonisation while also meeting customer demand in a period of unprecedented growth. Given the intermittent nature of renewable electricity sources such as wind and solar, the challenge of maintaining electricity grid stability and matching supply with demand grows as the share of electricity generation increases. Consequently, on occasions of low renewable availability, the electricity system needs a reliable, dispatchable and complementary fuel source to fall back on. Today, networked gas is the primary dispatchable fuel source in Ireland's electricity generation mix, fuelling almost half of all electricity generated each year and delivering much higher proportions (up to 90%) in times of peak electricity demand while still meeting heating demands.

As Ireland's reliance on intermittent renewable generation increases, the gas network's role in providing electricity system stability and security becomes even more critical. While annual gas demand for power generation is expected to fall by c.27% by 2032/33 relative to 2023/24, the peak day power generation gas demand is predicted to grow by c.11% across the same period and Ireland's electricity generators and system operators will rely increasingly on the capacity, resilience, and responsiveness of the gas network to meet these peaks.

In their draft National Resource Adequacy Assessment (NRAA) 2025-2034, EirGrid and SONI outline the expected electricity demand and the level of generation capacity that will be required on the island over the coming 10-year horizon. This adequacy assessment identifies any potential shortfall in supply capacity based on future peak electricity demand projections. The SEM Capacity Market is designed to procure enough generation capacity to meet the EirGrid/SONI adequacy shortfall projection. These annual Capacity Market auctions have resulted in capacity contracts being awarded to a number of technology types, primarily dispatchable generators and including high volumes of flexible gas-fired peaking power generation plants.

The continuing annual capacity auctions signal that there is capacity shortfall on the electricity system which needs to be addressed. There are short, medium and long-term requirements for additional flexible peaking power plants and this demand is expected to result in significant growth across this sector for gas-fired solutions requiring gas connections to the Gas Networks Ireland network. From 2030, the Climate Action Plan (CAP) targets increased zero emission gas generation from renewable gases such as biomethane and hydrogen, to enable a net-zero carbon power system. With this in mind, CAP 2023 outlined the potential inclusion of a policy, in the third carbon budget (2031-2035), to require future dispatchable generation to be zero carbon gas ready. The exact KPIs for carbon budget three are expected to be included in future CAP updates.

8.2. Industrial and commercial customers

The Industrial and Commercial (I&C) sector is of vital economic importance to Ireland and the gas network provides a crucial source of reliable, versatile, competitive and convenient energy, powering over 30% of industry in Ireland. While the majority of the c. 27,000 I&C customers comprise Small and Medium Enterprises (SMEs) and public buildings, the majority of the gas demand in this sector comes from c. 300 Industrial and Large Energy Users (LEUs).

In line with the Climate Action Plan, Gas Networks Ireland expects to see a decline in the number of SMEs and public buildings connecting to the gas network during the NDP period as district heating, retrofitting and heat pumps become more prevalent in this sector. However, networked gas will continue to be the fuel of choice for Industrial customers. Many of these businesses, both national and multinational, are dependent on gas as the energy solution they need to provide the high temperatures required to operate their key processing facilities (especially those in the pharmaceutical and food

& beverage processing sectors). For some I&C customers, such as those in the data centre sector, energy reliability is critical and networked gas is a preferred energy source reflecting the very high reliability our network offers. Some industrial operations require both electricity and high temperature processes; a dedicated, on-site source of electricity is often preferred in this scenario. Often this is provided via the installation of Combined Heat & Power (CHP) technology, typically a gas-fired turbine or engine operating to provide a secure and cost-effective source of electricity together with high temperature heat output captured from the turbine or engine (waste heat recovery process). The electricity generated on-site can be primary or secondary to grid supply but offers a competitive and often more sustainable source of electricity when factoring in the waste heat captured from the CHP process (efficiencies of up to 90% are achievable using well-designed CHP solutions).

Beyond these traditional business needs, all commercial customers are increasingly focused on the need to operate more sustainably, meet their corporate social responsibility obligations and reduce their carbon In Ireland expects to see a decline in the number of SMEs and public buildings connecting to the gas network during the NDP period as district heating, retrofitting and heat pumps become more prevalent in this sector. However, networked gas will continue to be the fuel of choice for Industrial customers. Many of these businesses, both national and multinational, are dependent on gas as the energy solution they need to provide the high temperatures required to operate their key processing facilities (especially those in the pharmaceutical and food & beverage processing sectors). For some I&C customers, such as those in the data centre sector, energy reliability is critical and networked gas is a preferred energy source reflecting the very high reliability our network offers. Some industrial operations require both electricity and high temperature processes; a dedicated, on-site source of electricity is often preferred in this scenario. Often this is provided via the installation of Combined Heat & Power (CHP) technology, typically a gas-fired turbine or engine operating to provide a secure and cost-effective source of electricity together with high temperature heat output captured from the turbine or engine (waste heat recovery process). The electricity generated on-site can be primary or secondary to grid supply but offers a competitive and often more sustainable source of electricity when factoring in the waste heat captured from the CHP process (efficiencies of up to 90% are achievable using well-designed CHP solutions).

Beyond these traditional business needs, all commercial customers are increasingly focused on the need to operate more sustainably, meet their corporate social responsibility obligations and reduce their carbon footprint. Recently, almost 70 companies, including Gas Networks Ireland and large manufacturing and agri-food companies in Ireland, have signed a carbon pledge to significantly reduce their emissions footprint between now and 203074. This desire to decarbonise is not only influencing companies' strategies on procuring their own source of energy (their scope 1 & 2 emissions), but also seeking to decarbonise supply chain emissions (scope 3 emissions).

While networked gas is particularly valued by many companies for its high-heat, high reliability characteristics and flexibility in meeting evolving demand, the natural gas supplied through our network today, whilst cleaner than many other fuels, is a fossil fuel. Over time fossil fuel consumption increasingly runs counter to the I&C sectors' sustainability and decarbonisation obligations, however, the emergence and scaling up of renewable gases (i.e. biomethane and green hydrogen) offers the potential for the commercial sector to retain the unique benefits of networked gas while still decarbonising their core processes and broader supporting operations.

Renewable gas is emerging as an important factor in securing ongoing and future investment in Ireland and a clear roadmap for the availability of low carbon gases is becoming a key requirement for many of these companies in choosing to locate or expand in Ireland. The existing gas network and customer on-site utility applications are fully compatible with biomethane which provides a near-term, effective, less intrusive pathway to decarbonising their operations and typically requires no additional gas consumer capital investment. Gas Networks Ireland has established a Renewable Gas Registry which allows end users to purchase renewable gas with confidence, as well as giving government and regulators the certainty that sales of renewable gas are transparent and are fully accounted. This is essential to supporting the growth of a renewable gas industry in Ireland and enables companies to verify renewable gas origin and sustainability credentials. The Renewable Gas Registry is also recognised by the EPA for use in the ETS sector. Gas Networks Ireland is working in partnership with industry, highlighting and facilitating the routes to procure indigenous biomethane. Section 4 contains further information on biomethane, the National Biomethane Strategy and the Renewable Gas Registry.

In the medium to long-term, indigenous green hydrogen is expected to provide an even more significant route for Industrial and Commercial companies to decarbonise via networked gas either as part of a hydrogen "cluster", via blended hydrogen or from dedicated segments of the national gas network dedicated to hydrogen transportation.

8.3. Residential customers

Gas Networks Ireland currently provides a safe, reliable and secure supply of natural gas to almost 690,000 residential customers throughout Ireland. The first iteration of the Climate Action Plan, published in 2019, signalled a major shift in domestic heating with a clear focus on heat pumps and district heating and a phase-out of oil and gas boilers. Subsequent iterations of the Climate Action Plan have reaffirmed this stance.

While gas heating systems, in combination with solar technology, can achieve current building regulation energy requirements (2019 Nearly Zero Energy Buildings (NZEB)) for new homes, it is intended that the Building Regulations will be further updated by Q1 2025 to effectively phase out fossil fuel boilers, where practical[71]. Gas Networks Ireland has therefore assumed no new homes will connect to the gas network from 2025 onwards.

For mature housing, the Climate Action Plan has also set out ambitious retrofit and heat pump targets to be hit by 2030. Gas Networks Ireland assume different volumes of gas disconnections across the NDP horizon in all three scenarios in response to these targets. However, there are some existing homes currently choosing to switch from more carbon intensive (oil and solid fuel) and less efficient (non-heat pump electric) heating sources to natural gas. Gas Networks Ireland expect this trend to continue in the short to medium term for homes where installing a heat pump is not financially or practically viable. In 2024 to date, there have been a steady level of mature housing connections to the gas network, with monthly connection numbers in the second half of 2024 exceeding those in the same period in 2023.

The challenges facing decarbonisation of this sector are significant, with multiple factors impacting on the delivery of the 2023 & 2024 Climate Action Plan for the roll out of heat pumps and phasing out of oil and gas boilers. A recent study has shown that, while the number of retrofits and associated dwellings achieving a B2 standard are increasing, the number of heat pump installations in existing houses has declined in 2024 compared to 2023[72]. This would suggest that homeowners are actively improving the energy efficiency of their homes but keeping existing, traditional heating technologies.

An alternative, yet complimentary, solution might see the adoption of hybrid heating technologies, combining both a gas boiler and a heat pump to provide the most efficient and cost effective (operationally) home heating solution. Hybrid heat pumps offer a lower cost alternative to fully electric heat pumps, they require less retrofitting work and are compatible with existing radiators due to the capability of the gas boiler to 'top-up' the temperature of the heating

Annual CO_2 Emissions by Transport Mode (MTCO2)

01	Private Car	5.746	49.7%
02	Heavy Goods Vehicle (HGV)	2.281	19.7%
03	Unspecified (Road)	1.262	7.6%
04	Light Goods Vehicle (LGV)	0.877	4.8%
05	Fuel Tourism	0.557	2.7%
06	Public Passenger	0.315	2.6%
07	Navigation	0.303	1.3%
08	Rail	0.149	0.3%
09	Gas Pipeline	0.037	0.4%
10	Domestic Aviation	0.041	10.9%
Total		11.568	

71 Climate Action Plan 2023
72 https://www.seai.ie/grants/home-energy-grants/home-upgrades

system as required. Hybrid heat pumps also have a lower impact on the electricity network and can be optimised to reduce electrical demand at peak times (by switching to gas mode). This could offer advantages in areas where the electricity network is constrained and/or reduce the need for electricity grid reinforcement.

Gas Networks Ireland are actively monitoring the development and deployment of hybrid heat pump technology in Europe and the UK and intend to commence independent research and testing in 2025.

Multi-occupancy buildings and large-scale apartment blocks often require tailored energy solutions. Combining networked gas with district heating technology, CHP and other renewable technologies has proven to be an effective and efficient solution for these buildings. However, recent engagement by Gas Networks Ireland with industry stakeholders has signalled the importance of these types of developments moving away from fossil fuel-based solutions to ensure the projects remain attractive to external investment. Hence, the growth in availability of renewable gases on the gas network is needed to incentivise gas-fired engines or boilers to be considered as an attractive future option in the heating of multi-occupancy buildings.

8.4. Transport

There is increasing demand from the transport sector for more decarbonised customer supply chain solutions. Being able to offer a lower-carbon transport solution is a strong differentiator for any business and it demonstrates a focus on sustainability when tendering for new business. Compressed Natural Gas (CNG), specifically renewable CNG (bioCNG), reliably delivered through the national gas network, offers a net-zero carbon fuel alternative to the commercial transport sector in Ireland. According to the SEAI Energy in Ireland Report[73], 34.3% of Ireland's energy-related emissions in 2022 came from the transport sector. In the same year, final energy consumption in the transport sector in Ireland was dominated by imported fossil fuels (97.4%). Ireland faces a significant challenge to meet its emission reduction targets, particularly in the transport sector, as it is one of the most difficult sectors to decarbonise. With a clear understanding of where the transport emissions are coming from, Ireland now requires a clear road map on how to deliver the required emission reductions.

When considering the percentage share of transport CO_2 emissions by sub-sector for transport, it is clear that private cars and Heavy Goods Vehicles (HGV's) are the most significant emitters with 49.7% and 19.7% of the total emissions coming from these transport modes respectively. While there is clear policy and support for the private car sector, with a focus on electrification, the emissions reduction pathway for the road freight sector is not as well-defined. Obstacles to the decarbonisation of this sector include the availability of suitable alternative clean and affordable technologies and fuels and vehicle range issues.

There are currently approx. 390,000 goods vehicles and 2.25 million private cars registered in Ireland.t Approximately 5% of all vehicles on Ireland's roads account for almost 20% of total emissions from this sector, and these are the heavy goods vehicles (HGVs). A recent report from the Department of Transport, 'National Demand Management Strategy' noted that 42,782 HGVs (>3.5 tonnes) were taxed in Ireland as at the end of 2023. Supporting these c. 43,000 HGVs to switch to cleaner alternatives would have a significant reduction in overall emission levels.

CNG is a safe and reliable mature technology with over 1.4 million CNG vehicles in use in Europe and close to 30 million worldwide.

Using CNG technology to power trucks and buses offers a real solution today to eliminating emissions from diesel-fuelled HGVs. CNG technology enables the vehicles to operate on natural gas or biomethane, with the fuel stored at high pressures (over 200 bar) and delivered to the engine. Advances in storage technologies are leading the way to reaching ranges comparable to diesel equivalent technologies. CNG vehicles are compatible with both natural gas and biomethane and the technology is particularly suitable for HGVs where electric solutions pose significant challenges (range and cost).

CNG Station at Circle K Cashel

New dedicated Flogas/Certa BioCNG Station at Keelings, Swords

There are currently almost 170 CNG HGV vehicles operating across the Republic of Ireland. The majority (95%) of these vehicles are operating on bioCNG (compressed biomethane). This biomethane, which can be indigenously produced or imported, is purchased by Gas Suppliers and sold to the market using the Irish Renewable Gas Certification Scheme administered by Gas Networks Ireland. This transport fuel is certified as a 100% renewable fuel. To provide an affordable carbon-neutral alternative fuel to diesel in the Irish market, Gas Networks Ireland has been developing a nationwide CNG fuelling network, co-located in existing forecourts, on major routes and close to urban centres. This will help satisfy the requirements of the EU's Alternative Fuels Directive which aims to establish CNG refuelling facilities along the TEN-T Core Road Network. It is also in line with the National Policy Framework for Alternative Fuels Infrastructure. The existing natural gas network can be utilised as a national vehicle refuelling network, giving the commercial transport sector access to a cleaner, more economical fuel with a similar operational performance to diesel. There are currently eight public CNG filling stations in operation across Ireland. These are operated by Circle K (Clonshaugh and Dublin Port in Dublin, Cashel in Tipperary and Ballysimon Road in Limerick), Lidon Group (Junction 14 on the M7 motorway in Co. Kildare), Flogas/Certa (Keelings St Margaret's Road, Swords, Dublin), Beauparc Panda (Ballymount in Dublin) and Virginia Transport (Maghera in Cavan). One more public CNG filling station is due to open in early 2025 (Beauparc Panda, Cappagh). All of these were developed and constructed by Gas Networks Ireland, with all eight funded by the Causeway Project (Irish and European innovation funding). There are also three private CNG stations in operation (Clean Ireland Recycling in Shannon, Virginia Transport in Ballycoolin and Gas Networks Ireland in Cork).

New Dedicated Lidon Group/Green Generation BioCNG Station at Junction 14, Monasterevin, Co. Kildare

Demand for bioCNG refuelling stations is growing in Ireland. To develop the market for gas as a transport fuel, real engagement and collaboration is required between all stakeholders in the sector, from HGV fleet operators to forecourt operators, network operators (gas grid), equipment suppliers (truck manufacturers), industry groups, government agencies and regulators. Additional policy supports are necessary for bioCNG forecourt operators and fleet owners and operators to support the business model for bioCNG infrastructure and vehicles and reduce investment risk. These are necessary to drive an increase in alternative fuel vehicles, leading to a lowering of emissions from this hard-to-abate transport sector.

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9. Commercial market arrangements

Key Messages:

- Gas Networks Ireland supports new entrants entering both the retail and wholesale gas markets.
- At EU level, the focus has moved to implementation of the European Green Deal, the REPowerEU plan and the recently finalised Hydrogen and Gas Markets Decarbonisation Package, with a view to both improving European security of gas supply and incentivising the accelerated decarbonisation of the European gas networks.

9.1. Republic of Ireland gas market

Gas Networks Ireland in providing transportation services to shippers and suppliers operating in the wholesale and retail markets interacts regularly with Regulatory Authorities and gas market participants. Gas Networks Ireland supports the development of new entrants to both the retail and wholesale markets by facilitating and advising on their entry into the gas market. The following is a non-exhaustive list of Gas Networks Ireland's responsibilities:

- Develop and maintain strategies for the Irish natural gas wholesale and retail markets;
- Maintain, and enhance where necessary, market rules which are included in the Code of Operations;
- Deliver compliance with EU and National legislation as well as playing a driving role in the development of market arrangements to achieve industry best practice;
- Implement legal and contractual arrangements required under Irish and European law in relation to shippers and suppliers;
- Coordinate industry meetings at both wholesale and retail levels;
- Manage the contracts of the companies licensed to ship gas through the transportation system; and
- Drive market change initiatives to deliver on decarbonisation targets.

Gas Networks Ireland plays a pivotal role in fostering relations with neighbouring transporters, regulators and government departments to further the aim of European gas market integration. Gas Networks Ireland's role in this regard has never been more important following Brexit which resulted in Ireland's gas network no longer being directly connected to that of another EU Member State. As a result, strong collaboration and engagement is required to minimise any issues that may arise as a result of Ireland being directly connected to a third country (GB) and the potential for divergence in legislative and regulatory regimes. Against this backdrop, and being cognisant of the potential associated challenges, Gas Networks Ireland will continue to ensure that a resilient, robust and safe gas network is maintained for customers through appropriate and efficient investment.

9.2. European developments

Energy policy developments in Europe continue to evolve at pace. In 2022, the EU responded to Russia's invasion of Ukraine through the REPowerEU Plan which sought to rapidly reduce dependence on Russian fossil fuels and accelerate the green transition. In 2023, the urgency to reduce dependency on Russian fossil fuels led the EU to make significant progress with the Green Deal and the Fit for 55 package. Efforts to diversify energy sources and enhance energy security were intensified, including the accelerated deployment of renewable energy projects and improved energy efficiency across Member States. Additionally, several legislative measures were finalised

to drive decarbonisation, such as stricter emissions standards for industries, increased support for clean technologies, and incentives for reducing carbon footprints. The EU also promoted biomethane and hydrogen by setting production targets and creating a regulatory framework to support their economies.

Figure 9-1 identifies the policies, regulations and directives related to the EU Green Deal that are in various stages of being implemented.

Figure 9-1: EU Green Deal

Gas Networks Ireland continues to proactively engage with EU Institutions, wider European policymakers and key EU gas associations as well as national stakeholders in the context of identifying implications of these developments for our business and the wider Irish gas and energy market.

A detailed policy context on all of the above EU developments is provided in Section 4. Operational preparation is ongoing in Gas Networks Ireland, and with key stakeholders, in respect of implementing the requirements set out in these packages, including of note the requirements set out in the Hydrogen and Decarbonised Gas Market Package and the Methane Emissions Reduction Regulation.

10. Gas network planning

Key Messages:

- In assessing the adequacy of the gas network capacity over the NDP horizon, Gas Networks Ireland compare the gas demand forecast for the coming 10 years to the gas supply outlook for the network. NDP 2024 finds that the Best Estimate 1-in-50 peak day demand is forecasted to surpass the current combined system entry capacity for the last eight years of the forecast.
- Gas Networks Ireland are progressing a series of capacity upgrade works at both compressor stations in Scotland, in Brighouse Bay and Beattock, allowing increased gas flow rates through the two sub-sea interconnectors connecting Ireland and GB. These works are currently in progress and will ensure sufficient supply capacity is available from GB to ensure that the Best Estimate 1-in-50 peak day demand is met across the NDP horizon.
- During 2023 and 2024, 14 projects were completed including 4 AGI Capacity Upgrades, and 10 Reinforcements of the Distribution Network.

This section provides information on planned capital investment and future investment proposals for transmission system projects in order to comply with statutory and regulatory requirements.

10.1. Investment planning

Gas Networks Ireland's planning and design teams assist in the development of transmission system projects and key infrastructural projects which are vital for the socio-economic development of the State. A key focus in the development of projects is on matters of proper planning and sustainable development having due regard for the environment. This process has been outlined in Section 3, which involves the application of a bespoke environmental planning and assessment tool used by the Gas Networks Ireland design and planning teams in consultation with the Gas Networks Ireland environmental team.

Future investment proposals are subject to approval from the Commission for Regulation of Utilities and the relevant consents and permissions as set out in Section 3. System operator requirements continue to evolve and both environmental and European legislative requirements will impact on future system development and operation.

Gas Networks Ireland continuously maintains the gas network to ensure a safe, efficient and reliable gas networks for the benefit of the communities it serves. In keeping with Gas Networks Ireland's Asset Management System (ISO55001) accreditation, information is gathered during maintenance interventions to inform future maintenance programmes and to shape and drive refurbishment and renewal decisions. Gas Networks Ireland has a comprehensive suite of asset lifecycle policy documents aligned to industry standards that describe in detail the approach to maintaining Gas Networks Ireland's network assets.

These Functional Specification and Requirement (FSR) documents provide detail on the various asset systems including key sections such as:

- Scope: this provides an overview of the assets and provides comprehensive technical detail on the relevant asset system and its anatomy, i.e. each of its primary parts/components;
- Asset Risk: these details how asset risk is assessed for, and how an asset risk score is assigned to, the assets, including Asset Health (probability-of-failure), Asset Criticality (consequence-of-failure) and failure modes (for each of the primary components); and
- Asset Lifecycle: this details the interventions, and associated requirements and criteria, which are applied to the management of the assets across all four stages of the asset lifecycle, including the asset information requirements.

10.2. Regulatory capital allowance

The CRU approves capital allowance for Gas Networks Ireland which fund the required investment on the network. Gas Networks Ireland is at the start of the third year of five of the fifth regulatory Price Control period (PC5).

Gas Networks Ireland's business plan for PC5 was submitted to the CRU in September 2022. This plan sets out the investment requirements for a five-year period to September 2027 to ensure the provision of a safe high-quality service for all gas customers, a continued focus on efficient spend, efficiently facilitating the energy transition and maintaining a safe and resilient network. The process was delayed due to the changed economic landscape that prevailed at the start of 2022, with the publication by the CRU of its final determination in respect of PC5 in December 2023. For more detail on what is included in the PC5 determination, please reference the Regulatory Framework Decision Paper[74].

Gas Networks Ireland is committed to reducing the Greenhouse Gas emissions intensity of our network operations by 50% by 2030 (from 2010 level). To this end, a project has been initiated to decarbonise our compressor stations located in Scotland, which will contribute significantly towards meeting this target. This project will be subject to EIA/AA in due course where required.

Capacity constraints projects, refurbishments and new connections are funded by the Price Control Capital Allowance and form part of the Regulated Asset Base ("RAB"). A portion of the cost of new connections and capacity upgrades related to large new connections may be funded directly by the customer in accordance with the New Connections Policy.

Future investment proposals outside of the initial determination are subject to approval from the Commission for Regulation of Utilities and the relevant consents and permissions. System operator requirements continue to evolve and both environmental and European legislative requirements will impact on future system operations.

10.3. Completed capital programmes

Capacity limitations are identified on the network and addressed through appropriate capital investment programmes in order to ensure continuity of supply to all customers. During 2023 and 2024, 14 projects were completed including 2 AGI Capacity Upgrades, and 10 Reinforcements of the Distribution Network[75]. These projects were subject to the appropriate consenting and planning regimes as set out in Section 3.

74 CRU2023140_CRU_Decision_on_the_PC5_Regulatory_Framework_380056.PDF (divio-media.com)

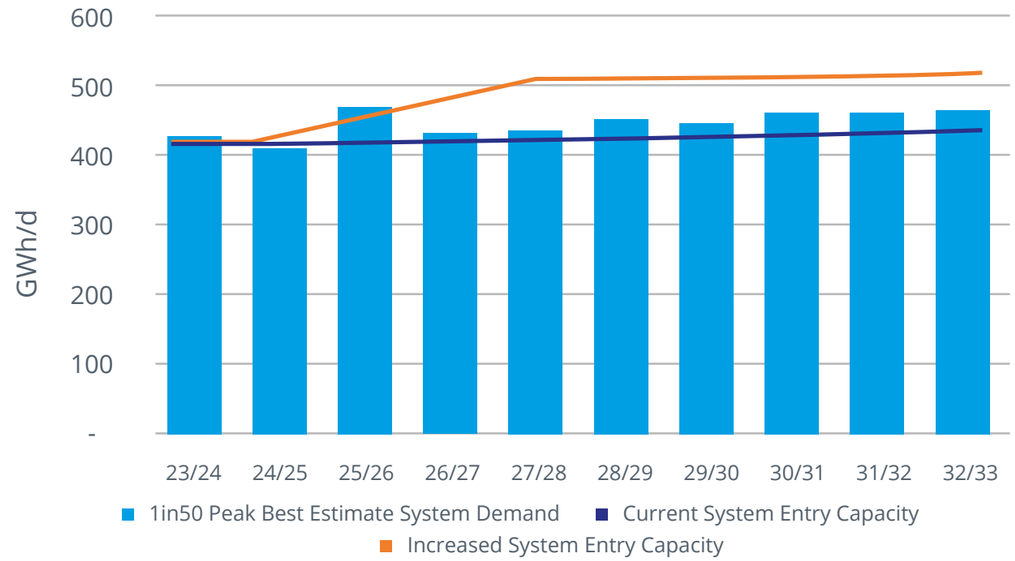
75 2023 – 2 AGI capacity upgrades and 6 distribution network reinforcements; 2024 - 2 AGI capacity upgrades and 4 distribution network reinforcements

10.4. Future system capacity

Gas Networks Ireland continuously assess the capability of the gas network to meet future gas demand by assessing the capacity of the network over the NDP horizon. Hydraulic modelling of the system is also carried out to identify network constraints which could require upgrades to Above Ground Installations (AGIs) and reinforcement of the transmission and distribution networks.

The Best Estimate demand scenario outlined in Section 6 is used to identify any potential capacity constraints. As part of the forecast modelling, Gas Networks Ireland compares the forecasted demands in Section 6 and the forecasted supplies in Section 7. In line with previous forecasts, NDP 2024 highlights that the Best Estimate 1-in-50 peak demand is forecasted to surpass the current combined system entry capacity for the final eight years of the NDP period as shown in Figure 10-1.

Figure 10-1: Combined system entry capacity versus peak day gas demand



Capacity on the interconnector pipelines is adequate to meet all gas demand projections over the 10-year horizon, the potential constraint arises at the associated compressor station installations in Scotland. Having received funding approval from the CRU in 2023, Gas Networks Ireland is progressing a series of upgrades which are forecasted to provide incremental increases in capacity at both compressor stations as shown in figure 10.1. These works include:

- An increase of the capacity at Beattock compressor station up to c. 43 mscm/d.
- An increase in the capacity at Brighouse Bay compressor station up to c. 39 mscm/d.

Gas Networks Ireland will keep this potential constraint under review in subsequent Network Development Plans.

The Southern Area Reinforcement (SAR) project is a planned upgrade of Baldrumman and Goatisland AGIs which will support network pressures at periods of peak demand in the peripheral areas of the network, in particular the Cork area. This is required due to the depleting gas supply from the Corrib field and the projected increases in peak day demands.

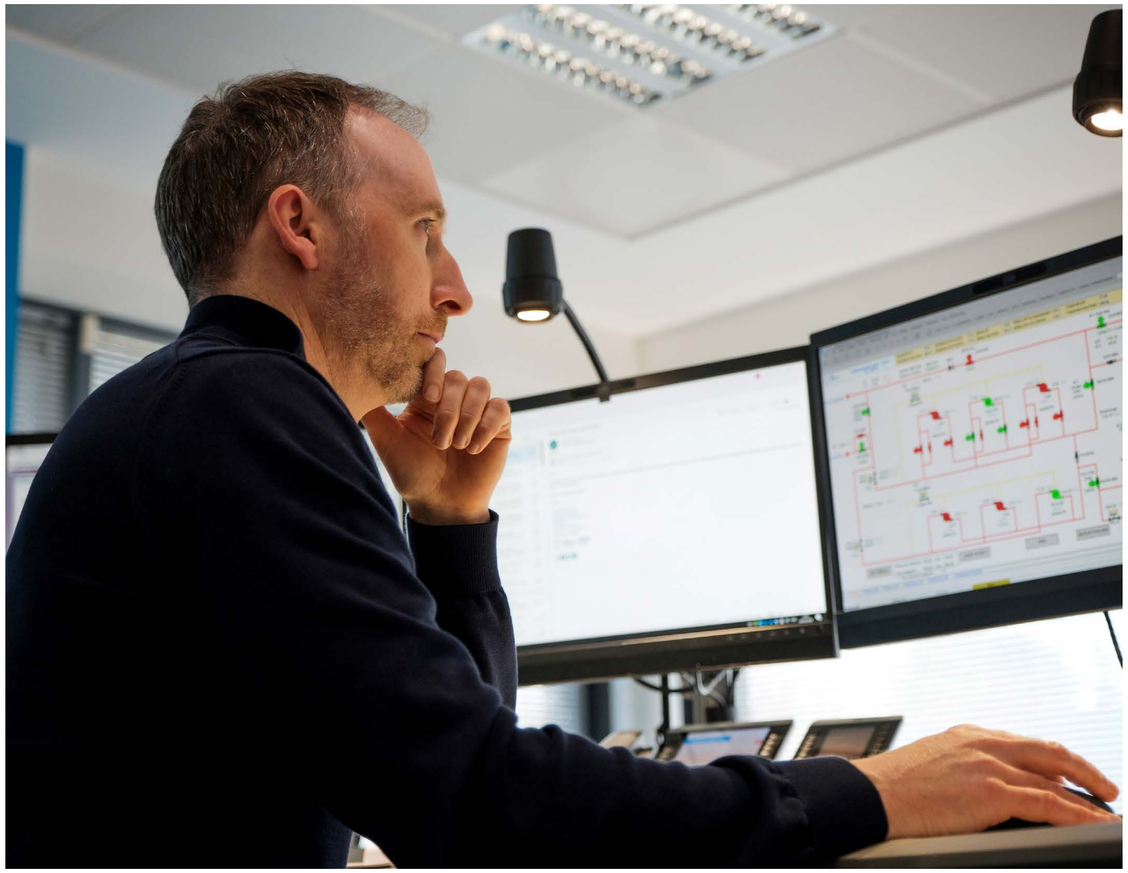
10.5. Decommissioning

As outlined in section 6 above, Gas Networks Ireland forecast that the number of customers connected to the gas network is expected to change significantly over the coming 10-year period. These forecast disconnections are driven by the CAP 2024 targets for heat pumps, district heating and any other potential zero carbon heating technologies replacing gas-fired heating systems in both the Residential and Industrial & Commercial sectors.

To date, Gas Networks Ireland has seen low levels of disconnections from the network, with no obvious geographical pattern, i.e. they are dispersed throughout the network. In the future, if the rate of disconnections reaches that included in the Best Estimate, it is more likely that Gas Networks Ireland will see groupings of disconnections by geographical location e.g. for example as a result of a local district heating scheme.

Section 4 above gives a high level overview of the Gas and Hydrogen Package, the Directive of which is due to be interpreted and transcribed into Irish law by August 2026. This Directive includes requirements for Distribution System Operators (DSOs) to include decommissioning plans, as applicable, in their Network Development Plans should a reduction in gas demand be forecast.

Hence, as the no. of disconnections included in this NDP materialise, Gas Networks Ireland intend to draft specific decommissioning plans for the relevant areas of the network as applicable and include those plans in future NDPs.



11. CRU Commentary

WITH In accordance with Article 22 of EU Directive 2009/73/EC ("the Directive") and Part 4 of Statutory Instrument S.I.16 of 2015, Gas Networks Ireland (GNI), as Ireland's gas Transmission System Operator, is required to publish a ten-year Network Development Plan (TYNDP).

TYNDP 2024 was developed through a process of engagement initially between Gas Networks Ireland and CRU where the system operator presented its draft modelling to CRU. The initial draft TYNDP was submitted to the CRU for analysis and comments on the text of the report. A further draft was submitted, taking the CRU comments into consideration, and the draft TYNDP 2024 was then approved, by the CRU, for publication for the consultation which took place between 28 February 2025 and 11 April 2025. The CRU undertook the consultation of all actual or potential system users in an open and transparent manner, in accordance with Article 22(4) of the Directive. In total, eight responses to the consultation were received from Cork Chamber, BnM, BGE, Energia, Chambers Ireland, An Taisce, Not Here Not Anywhere and SSE. All responses to the consultation are published on the CRU website.

Having examined the draft TYNDP 2024, considered the consultee responses, and engaged with Gas Networks Ireland, the CRU is of the view that the NDP developed by Gas Networks Ireland represents a reasonable representation of potential supply and demand scenarios for gas over the ten year horizon of the plan, noting Gas Networks Ireland's supply and demand assumptions are likely to be subject to change in the coming years, considering, inter alia, the potential for siGas Networks Irelandficant volumes of additional Large Energy User (LEU) gas demand, and the uncertainties inherent in Gas Networks Ireland's projections of renewable gases. The CRU notes that the NDP 2024 does not account for uncontracted LEU gas demand. If high levels of additional demand were to be actualised, then it would have a material impact on the ten year forecasts, and additional measures would be required to ensure the security of supply of the gas network, particularly during times of severe winter peak demand.

Gas Networks Ireland submitted their consultation report to the CRU and having analysed the submissions, the CRU are satisfied that the consultation report prepared by the system operator is a reasonable response to the submissions by consultees. The CRU approves Gas Networks Ireland's draft TYNDP document for final publication (subject to the correction of an error in Figure 10-1, as outlined in the Gas Networks Ireland consultation document).

The CRU considers that there is scope to continue the process of further developing and improving the TYNDP iteratively from issue to next issue, in particular in relation to the following areas, which have been discussed with Gas Networks Ireland – alignment of assumptions and scenario development with EirGrid & SONI's All Island Resource Adequacy Assessment (AIRAA), alignment with new legislative requirements on building performance, potential for improved assessment of fugitive emissions and improved data transparency. An update to Gas Networks Ireland's methodology document is also expected in the coming months. The CRU will continue to work with Gas Networks Ireland on the key issues raised by the respondents, as outlined above, during the preparation of the next iteration of the TYNDP in 2025 / 2026.

As required under CRU's PC5 Regulatory Framework[76], Gas Networks Ireland will be required to produce a detailed planning document in alternating years with the NDP, the Core Flexibility Report (CFR), which demonstrates Gas Networks Ireland's adoption of long-term adaptive / scenario planning. It is expected that the CFR should acknowledge and respond to the key policy / sector changes that Gas Networks Ireland expect in the medium to long-term (covering at least the next ten year period) and should describe a central plan / pathway for the development of the gas network.

The Government published its Energy Security in Ireland to 2030 package in November 2023 which outlines the strategy for a secure energy system in Ireland this decade while ensuring a sustainable transition to a carbon neutral system by 2050. The package contains a resilience work programme with specific actions for the gas sector which will be a factor in the development of the gas network. A key aspect of this package is Action 17, which sets out to create a strategic gas emergency reserve (SGER), which the Government approved in March 2025. The delivery of a temporary gas reserve is critical to Ireland's energy security and importantly, the SGER will also ensure compliance with the EU N-1 standard and regulation. Future TYNDPs are expected to take account of this measure once its development has sufficiently progressed.

The proposed decision paper on LEU connection policy was published by the CRU for consultation on 18th February 2025. The purpose of this proposed decision paper is to set out a potential pathway for connection applications for new data centre customers to the electricity grid with due regard to security of supply and network constraints while minimising, where possible, potential impacts on national renewable energy targets and carbon emissions. The CRU is not proposing to introduce any new decisions relating to connections to the gas network as part of the LEU connection policy review process but acknowledges that further policy analysis and work is required on this and outlines the parallel work underway relating to gas connections in Section 4 of the proposed decision paper. Subject to the issuing of a final decision by the CRU, subsequent versions of the TYNDP are expected to account for the effect of this policy on the ten year horizon.

76 CRU2023140_CRU_Decision_on_the_PC5_Regulatory_Framework_380056.PDF (divio-media.com)

The CRU would like to highlight the following elements of the TYNDP 2024 that would be expected to feed into the future role of a secure and decarbonised gas network in Ireland.

The results of Gas Networks Ireland's gas demand forecasting across their low demand, high demand and best estimate scenarios shows a decrease in total annual gas demand in IE between 2023/24 and 2032/33. The best estimate forecasts a 14% fall in demand between those years with the peak in demand expected to arrive in 2025/26 in that scenario and the high demand scenario, falling thereafter. Gas demand is expected to remain stable in the low demand scenario out to 2025/26 and then fall. The observed decreases across the three scenarios are driven by the anticipated fall in both power generation and residential gas demand due to increased renewable generation, energy efficiency measures, electrification of home heating and uptake of district heating schemes.

The Moffat Entry Point will remain the key supply point for Ireland in the future, particularly in the context of the declining output from the Corrib Gas Field in the coming years. For 2023/24, the Corrib gas field met 22% of IE annual gas demand with the Moffat Entry Point providing the remaining 78%. However, Corrib is projected to decline in its share of supply, and by the end of the forecast horizon (2032/33), Corrib is expected to account for 8% of IE annual demand. By 2032/33, Moffat is projected to account for 70.4% of IE demand, of which 0.7% is project to be imported hydrogen. While supply from the Corrib gas field is expected to decrease over the next ten years, this is anticipated to be partly offset by renewable gasses, with increased levels of biomethane, and hydrogen, anticipated to be included as part of supply.

The CRU would like to highlight that, in line with previous forecasts, TYNDP 2024 highlights that the Best Estimate 1-in-50 peak demand is forecasted to surpass the current combined system entry capacity for the final eight years of the NDP period (i.e.2025/26 to 2032/33). The TSO has outlined that the constraint arises at the compressor stations in Scotland. Gas Networks Ireland have received funding approval in the PC5 decision to progress incremental capacity upgrades at both compressor stations to address the identified constraints. The upgrades are taking place on a phased basis with additional capacity provided at each phase. The delivery by Gas Networks Ireland of the system capacity upgrade projects is expected to provide sufficient increased capacity for forecasted 1 in 50 peak days over the period of the TYNDP, as discussed in Section 10 of the plan. The CRU will continue to monitor and review this forecast shortfall in subsequent TYNDPs.

Gas Networks Ireland have forecast a 33% decrease in carbon emissions relating to gas demand supplied by the gas network by in their best estimate scenario (relative to 2023/24), the low and high gas demand scenarios also project decreases of 56% and 2.4% respectively. Further decreases in carbon emissions from the network are forecast beyond 2030 as more biomethane and hydrogen is anticipated to be incorporated into the system.

The CRU is continuing to work closely with Department of Climate, Energy and the Environment (DCEE), Gas Networks Ireland, the European Commission and the Department for Energy Security and Net Zero to monitor and manage Ireland's energy security.

The CRU would like to take this opportunity to thank Gas Networks Ireland for producing the TYNDP, while acknowledging the work done maintaining Ireland's security of supply.

Appendix 1: Historic demand

Historic Daily Demand by Metering Type

The historic demand data in Section 5 is presented by sector (i.e. residential, I/C and power generation), as this is more useful for forecasting purposes and is also considered to be a more familiar classification for the users of this document. The actual demand data is collected by metering type,

- Large Daily Metered (LDM) sites with an annual demand of 57 GWh or greater and includes all the power stations and the large Industrial and Commercial sites.
- Daily Metered (DM) sites with an annual demand greater than 5.55 GWh and less than 57 GWh, and includes the medium Industrial and Commercial, hospitals and large colleges etc.
- Non-Daily Metered (NDM) with an annual demand of 5.55 GWh or less and includes the small Industrial and Commercial and residential sectors.

The demands of the above categories are then re-combined into the following categories for reporting and forecasting purposes, using the monthly billed residential data to split the NDM sector into its residential and Industrial and Commercial components:

- Power sector: The individual power stations are separated out from the LDM total.
- The Industrial and Commercial sector: Which is comprised of the demand from the remaining LDM sites, the DM sector and the NDM Industrial and Commercial sector (calculated as the residual of the total NDM demand and the residential demand).
- Residential sector: Which is calculated as a percentage of the NDM demand, using the ratio of the total billed monthly NDM and residential demand.

The historical daily demand on the transmission and distribution systems is shown in Figure A1-1 and A1-2.
The transmission and distribution daily demands have been broken down into the following sub-categories:

- Transmission demand has been subdivided into the power sector demand, with all of the remaining LDM and DM Industrial and Commercial demand combined into the TX DM Industrial and Commercial category; and
- Distribution demand has been subdivided into the DX NDM demand, with all of the remaining LDM and DM Industrial and Commercial demand combined into the DX DM Industrial and Commercial category.

Table A1-1: Historic Gas Networks Ireland annual gas demands (actual)[77]

GWh/yr	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
ROI	50,072	47,582	47,136	51,478	55,070	56,348	57,481	58,354	56,050	55,900	53,470	51,612
NI & IOM	15,031	15,132	16,970	16,992	18,168	16,984	17,005	17,693	18,798	17,748	16,722	18,835
Total	65,103	62,714	64,106	68,470	73,237	73,332	74,485	76,046	74,848	73,647	70,193	70,447

Table A1-2: Historic Gas Networks Ireland peak day gas demands (actual)

GWh/d	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
ROI	213.2	187	203.8	199.4	221.8	215.9	218.5	225.4	248.5	233.0	261.9	250.7
NI & IOM	62.7	68.2	72.8	69.9	70.1	63.1	75.9	70.6	82.3	79.1	83.7	77.3
Total	275.9	255.2	276.6	269.2	291.9	279	294.4	295.9	330.9	312.1	345.7	328.0

Table A1-3: Historic ROI annual gas demands (actual)

GWh/yr	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Power[77]	28,156	26,910	24,708	29,061	32,181	31,936	33,050	33,772	31,349	33,071	32,306	29,747
I/C	13,700	13,682	15,013	15,581	15,835	16,485	17,149	16,879	16,797	15,728	15,045	15,659
Residential	8,216	6,991	7,414	6,835	7,054	7,927	7,282	7,693	7,905	7,078	6,119	6,207
Transport	0	0	0	0	0	0	0	10	20	23	24	35
Total	50,072	47,582	47,136	51,478	55,070	56,348	57,481	58,354	56,072	55,923	53,494	51,647

Table A1-4: Historic ROI peak day gas demands (actual)

GWh/d	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Power	119.9	102	102.4	104.7	121.6	110.1	113	129.4	134.3	144.7	156.1	156.2
I/C	50.4	46.8	54.8	54.9	56.6	61	60.2	58.8	59.3	49.7	56.6	54.0
Residential	44.2	39.9	46.6	40.1	43.6	44.8	45.3	37.2	55	39.0	49.2	40.5
Total	214.4	188.7	203.8	199.7	221.8	215.9	218.5	225.4	248.5	233.5	261.9	250.7

The transmission connected demand, Figure A1-1, does not appear to be sensitive to seasonal changes in weather. The gas demand of the power sector is driven by relative fuel-prices rather than seasonal changes in weather, as well as electricity demand and the penetration of renewables.

77 Power sector gas demand is amended to account for those I/C connections which generate electricity for their own use less process gas

It can be seen from Figure A1-2 that the distribution connected demand is very weather sensitive, peaking in the colder winter period and falling off in the warmer summer period. The NDM demand is particularly weather sensitive, as it includes the residential and small I/C sectors, which primarily use gas for space heating purposes.

Figure A1-1: Historic ROI daily demand of transmission connected sites

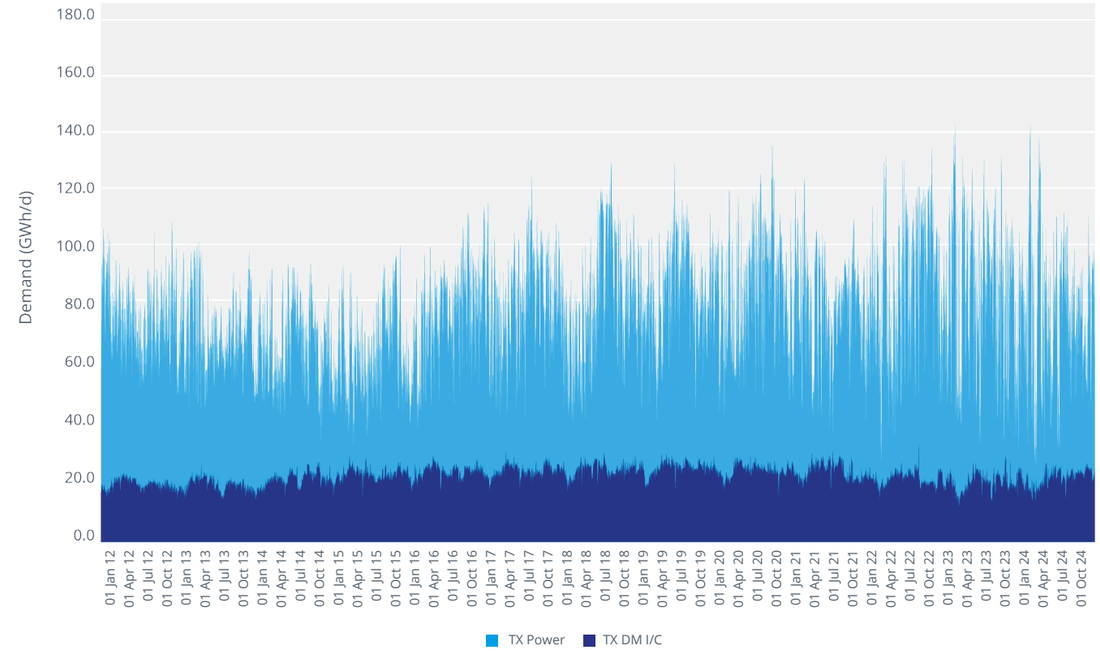


Figure A1-2: Historic ROI daily demand of distribution connected sites

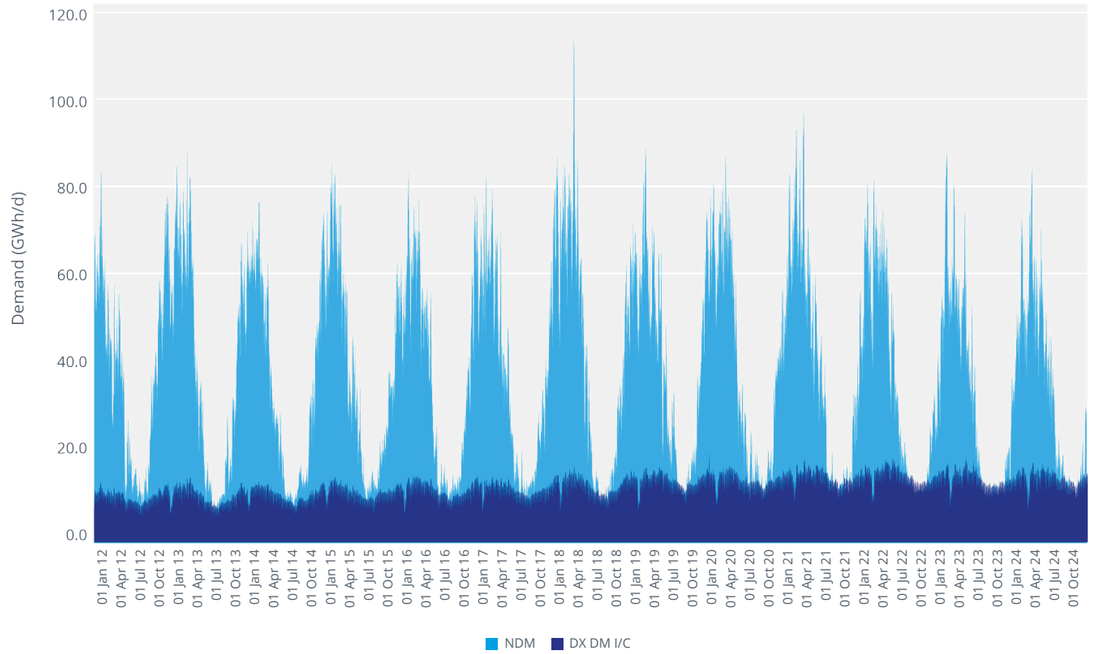


Table A1-5 and Table A1-6 present the historic annual and peak day gas supplies for Gas Networks Ireland's system.

Table A1-5: Historic annual supplies through moffat, inch and corrib

GWh/yr	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Moffat[78]	64,148	62,549	63,132	45,731	35,494	39,060	46,544	54,216	59,417	59,188	57,873	60,177
Inch	4,014	3,339	3,724	3,674	3,872	3,696	2,784	1,571	3	0	0	0
Corrib	-	-	-	20,470	34,659	32,612	26,747	21,217	16,520	15,494	12,320	11,450
Total	68,162	65,888	66,856	69,876	74,025	75,368	76,074	77,004	75,940	74,682	70,193	71,627

78 Table shows total Moffat supplies including ROI, NI and IOM

Table A1-6: Historic peak day supplies through moffat, inch and corrib

GWh/d	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Moffat	251.2	232.7	248.3	189.5	172.9	171.4	213.2	233.9	280.8	269.6	306.9	303.5
Inch	26.7	26.4	28	19.6	16.8	11.2	9.7	5.7	-	-	-	-
Corrib	-	-	-	60.1	103.7	97.1	78.5	61.9	52.3	45.4	37.9	30.4
Total	277.9	259.1	276.3	269.3	293.4	279.7	301.4	301.4	333.1	315.0	344.8	333.9

The peak-day demands shown in Table A1-7 represent the coincident peak-day demands, i.e. the peak-day demand of each sector on the date of the overall system peak-day demands. Each sector may have had a higher demand on a different date. The non-coincident peak-day demand of each sector is shown in Table A1-8.

Table A1-7: Historic coincident peak day and annual ROI demands

GWh/d	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Peak Day												
TX Power	119.9	102	102.4	104.7	123.8	106.1	113	129.4	134.3	144.7	156.1	156.2
TX DM I/C	17.8	16.1	18.8	21.1	20	21.7	20.3	23.1	18.7	16.8	14.6	16.1
DX DM I/C	12.2	12.6	13.3	13.5	13.6	14	15.5	15.5	15.8	14.8	16.6	15.8
DX NDM	64.6	57.9	69.4	60.4	61.2	68.4	69.7	57.4	79.8	57.2	74.7	62.7
Total ROI	214.4	188.7	203.8	199.7	218.6	210.1	218.5	225.4	248.5	233.5	261.9	250.8
Annual												
TX Power	28,156	26,910	24,708	29,061	32,181	31,936	33,050	33,772	32,389	33,071	32,306	29,747
TX DM I/C	6,088	6,439	7,085	7,455	7,562	7,642	7,888	7,659	7,699	6,760	6,338	6,796
DX DM I/C	3,419	3,432	3,593	3,776	3,842	4,038	4,494	4,570	4,754	4,903	4,705	4,692
DX NDM	12,409	10,802	11,749	11,184	11,485	12,733	12,049	12,343	12,563	11,143	10,121	10,417
Total ROI	50,072	47,582	47,136	51,478	55,070	56,348	57,481	58,344	57,405	55,877	53,470	51,652

Table A1-8: Historic non-coincident peak ROI demand by sector

GWh/d	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Peak Day												
TX Power	119.9	108.7	103.2	123.2	127.3	142.2	141.5	148.4	136.5	147.7	156.1	156.2
TX DM I/C	22.9	23.1	25.1	25.4	26.3	26.4	26	25.2	26.5	28.7	25.0	17.2
DX DM I/C	13.7	12.8	13.8	14.1	14	15.8	15.9	18.7	17.3	17.7	17.5	16.8
DX NDM	75.5	65.8	73.5	71.5	71	97.2	76.4	74.8	83.2	69.9	75.1	72.4
Total ROI	231.9	210.4	215.6	234.1	238.6	281.7	259.8	267.1	263.5	264.0	273.7	262.6
Power	119.9	108.7	103.2	123.2	127.3	142.2	141.5	148.4	136.5	147.7	156.1	156.2
I/C	59.1	56.5	62.7	63.4	64.3	74.4	68.6	69.2	70.4	68.5	63.3	59.4
Residential	52.9	45.2	49.7	47.6	47	65	49.6	49.5	56.6	47.8	54.4	47.0
Total ROI	231.9	210.4	215.6	234.1	238.6	281.7	259.8	267.1	263.5	264.0	273.7	262.6

Appendix 2: Demand forecasts[79]

Assumptions

As outlined in Section 5 assumptions are made regarding a number of key demand drivers. These are summarised in Table A2-1 to Table A2-3.

Table A2-1: Future GDP annual growth

GNI Growth (%)	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Low (GDP)	2.08	1.07	1.14	1.18	1.18	1.18	1.18	1.18	1.18	1.18
Best Estimate	2.93	2.14	2.29	2.35	2.35	2.35	2.35	2.35	2.35	2.35
High	2.93	2.14	2.29	2.35	2.35	2.35	2.35	2.35	2.35	2.35

Table A2-2: Residential new connections

	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Low (GDP)	2,834	1,921	1,683	1,483	1,283	1,083	883	833	833	833
Best Estimate	3,954	2,919	2,142	1,817	1,617	1,417	1,367	1,367	1,367	1,367
High	4,441	3,832	3,667	3,667	3,667	3,667	3,667	3,667	3,667	3,667

Table A2-3: Residential disconnections

	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Low (GDP)	1,370	2,120	30,745	40,574	41,181	41,721	41,847	41,847	41,847	41,847
Best Estimate	1,370	2,120	8,324	14,785	23,731	26,216	26,216	26,216	26,216	26,216
High	1,370	2,120	3,220	4,102	5,229	6,739	7,140	7,140	7,140	7,140

79 The timing of the modelling Data Freeze has the result that the 10-year forecast is based on forecasted 2022/23 demand, given that the gas year extends from October to September each year. Hence, forecasted 2022/23 data is included in tables A2-1 through to A2-14.

Forecast

The demand forecasts are summarised in Tables A2-4 to A2-12. Table A2-13 presents the various supply sources by entry point, both existing and proposed. The values represent the maximum supply volume each source could potentially provide.

The ROI demand is broken down by sector, while the total demand is given for NI and the IOM. It should be noted that the figures in the tables may not sum to total due to rounding. The forecasts are based on the following weather scenarios:

- Tables A2-4, A2-5 & A2-6: Peak-day gas demand under severe 1-in-50 weather conditions, i.e. weather so severe that it is statistically likely to occur once every 50 years;
- Tables A2-7, A2-8 & A2-9: Peak-day gas demand under 'average year' weather conditions, i.e. the weather conditions that typically occur each year; and
- Tables A2-10, A2-11 & A2-12: Annual gas demand in average year weather conditions.

The NI peak-day demand used for both the 1-in-50 and average year weather forecast is based on information published in the Northern Ireland Gas Capacity Statement[80]. The IOM peak-day is based on information provided by the Manx Electricity Authority (MEA).

Weather correction is only applied to the distribution connected load, i.e. primarily to the residential and small I/C sectors. There is no weather correction applied to the power sector gas demand forecast.

The power generation peak-day gas demand forecast assumes that all the non-gas fired thermal power stations are available on the day, i.e. all coal and oil-fired power stations. If there is a forced outage of one or more of the non-gas fired thermal power stations, then the peak-day gas demand of the sector may be higher than indicated in the above forecasts.

Table A2-4: 1-in-50 peak day demand – low demand scenario

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	164.3	147.9	152.5	153.3	140.1	146.4	148.9	155.7	154.0	149.1
IC	66.7	66.8	80.0	79.2	77.4	75.4	73.4	71.3	69.0	66.7
Residential	57.0	56.9	54.4	51.1	47.6	44.2	40.6	37.1	33.6	30.1
Transport	0.1	0.1	0.1	0.2	0.4	0.6	0.8	0.8	0.9	0.9
Own Use	4.9	4.6	4.7	4.4	4.3	4.2	4.3	4.1	3.9	3.8
Sub total	293.0	276.3	291.7	288.2	269.9	270.9	268.0	269.0	261.3	250.6
IOM	6.9	6.9	6.9	6.9	6.7	6.7	5.6	5.5	2.0	2.0
NI	117.27	107.16	116.85	100.35	112.69	112.99	119.03	120.40	115.58	121.96
Total	417.1	390.4	415.4	395.4	389.3	390.6	392.7	394.9	378.8	374.6

80 NIGCS 23.24 Report (gmo-ni.com)

Table A2-5: 1-in-50 peak day demand – best estimate demand scenario

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	167.4	148.5	184	157.5	159.4	167.4	173.4	176.5	184.2	186.3
IC	67	67.8	82.1	82.7	82.4	82	81.5	81	80.3	79
Residential	57.1	57	56.4	55.2	53.2	51.1	48.9	46.7	44.6	42.4
Transport	0.1	0.1	0.2	0.3	0.6	0.7	0.8	0.9	0.9	1
Own Use	5	4.9	5.1	5.1	5.2	5.1	5.3	5.2	5.1	5
Sub total	296.5	278.3	327.8	300.7	300.7	306.4	309.9	310.3	315	313.7
IOM	6.9	6.9	6.9	6.9	6.7	6.7	5.6	5.5	2	2
NI	121	121.9	131.1	119.6	123.1	131.1	122.8	138.8	131.3	142.1
Total	424.4	407	465.7	427.2	430.6	444.3	438.4	454.6	448.3	457.7

Table A2-6: 1-in-50 peak day demand – high demand scenario

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	174.0	157.1	195.7	166.8	179.0	192.7	192.6	198.6	204.2	218.5
IC	67.0	68.0	83.6	85.5	91.0	92.2	92.7	98.6	99.5	100.0
Residential	57.1	57.0	56.9	56.7	56.4	55.9	55.5	55.0	54.5	54.0
Transport	0.1	0.2	0.3	0.7	1.3	1.9	2.2	2.5	2.9	3.2
Own Use	5.0	4.9	5.1	5.1	5.3	5.2	5.4	5.3	5.3	5.2
Sub total	303.1	287.2	341.5	314.9	332.9	348.0	348.4	360.0	366.3	380.9
IOM	6.9	6.9	6.9	6.9	6.7	6.7	5.6	5.5	2.0	2.0
NI	125.8	125.9	135.7	131.1	130.1	141.7	140.6	145.5	141.3	146.2
Total	435.7	420.0	484.1	452.8	469.8	496.4	494.7	511.1	509.6	529.0

Table A2-7: average year peak day demand – low demand scenario

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	154.7	133.7	138.1	144.8	128.6	142.4	139.4	137.5	136.2	138.1
IC	49.8	57.3	66.3	67.2	64.4	61.2	61.8	55.1	57.6	56.6
Residential	36.0	41.2	41.7	34.8	32.9	27.9	28.1	24.7	21.2	19.0
Transport	0.1	0.1	0.1	0.2	0.4	0.6	0.8	0.8	0.9	0.9
Own Use	3.9	3.8	3.9	3.8	3.5	3.6	3.5	3.3	3.2	3.2
Sub total	244.5	236.1	250.2	250.7	229.8	235.6	233.6	221.6	219.1	217.7
IOM	6.0	6.0	5.2	4.7	4.7	4.7	3.4	3.4	0.9	0.9
NI	81.4	78.6	82.5	81.3	83.2	86.4	86.3	92.5	90.4	98.5
Total	331.9	320.8	337.9	336.8	317.7	326.8	323.4	317.5	310.4	317.1

Table A2-8: Average year peak day demand – best estimate demand scenario

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	160.7	137.7	149.4	145.1	149.0	145.8	157.7	174.9	162.3	163.4
IC	50.2	58.3	66.9	72.3	68.3	68.3	68.1	62.4	67.7	68.7
Residential	36.0	41.1	38.6	37.8	36.7	35.2	33.7	30.9	30.7	29.1
Transport	0.1	0.1	0.2	0.3	0.6	0.7	0.8	0.9	0.9	1.0
Own Use	4.1	4.1	4.2	4.1	4.2	4.1	4.3	4.3	4.3	4.2
Sub total	251.1	241.3	259.2	259.8	258.8	254.1	264.7	273.4	266.0	266.4
IOM	6.0	5.4	5.2	4.7	4.7	4.7	3.4	3.4	0.9	0.9
NI	79.3	87.1	84.3	82.8	84.1	86.1	93.7	100.5	101.4	103.3
Total	336.4	333.8	348.7	347.3	347.7	344.9	361.9	377.3	368.3	370.6

Table A2-9: Average year peak day demand – high demand scenario

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	161.6	142.5	153.3	151.3	147.4	155.9	168.3	180.5	180.7	188.1
IC	50.3	58.5	68.9	71.3	73.4	72.0	73.2	71.8	73.5	73.2
Residential	36.0	41.0	43.6	38.5	41.0	42.8	39.7	37.6	41.7	37.0
Transport	0.1	0.2	0.3	0.7	1.3	1.9	2.2	2.5	2.9	3.2
Own Use	4.0	4.0	4.2	4.1	4.3	4.4	4.6	4.7	4.8	4.8
Sub total	251.9	246.2	270.2	265.9	267.5	277.1	288.0	297.2	303.6	306.2
IOM	6.0	6.0	5.2	4.7	4.7	4.7	3.4	3.4	0.9	0.9
NI	79.9	87.1	86.8	86.0	89.3	94.5	96.6	105.7	103.6	108.0
Total	337.9	339.3	362.1	356.6	361.5	376.3	388.0	406.3	408.0	415.1

Table A2-10: Annual demand – low demand scenario

TWh/yr	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	27.7	22.7	26.8	24.5	22.3	18.3	14.8	10.8	8.6	6.8
IC	15.6	15.7	16.2	16.3	16.2	15.9	15.5	15.3	15.1	15.0
Residential	6.7	6.6	6.3	6.0	5.6	5.2	4.7	4.3	3.9	3.5
Transport	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.3
Own Use	0.7	0.7	0.8	0.7	0.7	0.6	0.6	0.5	0.4	0.4
Sub total	50.8	45.7	50.1	47.5	44.9	40.1	35.9	31.2	28.4	26.0
IOM	1.6	1.5	1.3	1.2	1.2	1.2	0.9	0.9	0.2	0.2
NI	18.8	16.9	18.1	16.3	16.8	16.0	16.1	15.4	14.7	13.7
Total	71.2	64.2	69.5	65.0	62.9	57.4	52.9	47.5	43.3	40.0

Table A2-11: Annual demand – best estimate demand scenario

TWh/yr	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	28.6	25.9	31.7	31.2	30.1	28.4	29.7	25.8	22.8	20.9
IC	15.8	16.0	16.7	17.1	17.2	17.2	17.2	17.3	17.4	17.5
Residential	6.7	6.7	6.6	6.4	6.2	6.0	5.7	5.5	5.2	4.9
Transport	0.032	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.4
Own Use	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.7
Sub total	51.8	49.4	56.0	55.7	54.7	52.7	53.8	49.7	46.6	44.4
IOM	1.6	1.5	1.3	1.2	1.2	1.2	0.9	0.9	0.2	0.2
NI	19.1	18.0	19.2	19.2	20.7	20.3	21.6	20.9	20.4	16.4
Total	72.5	68.9	76.5	76.1	76.6	74.2	76.3	71.5	67.2	61.0

Table A2-12: Annual demand – high demand scenario

TWh/yr	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	29.3	27.5	35.0	35.5	35.4	35.0	37.1	39.4	38.5	34.0
IC	15.8	16.1	16.8	17.3	17.6	17.8	17.9	18.1	18.4	18.7
Residential	6.7	6.7	6.6	6.6	6.6	6.5	6.5	6.4	6.4	6.3
Transport	0.0	0.1	0.1	0.3	0.5	0.7	0.8	0.9	1.0	1.2
Own Use	0.8	0.8	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0
Sub total	52.6	51.0	59.5	60.6	61.1	61.0	63.3	65.9	65.4	61.1
IOM	1.6	1.5	1.3	1.2	1.2	1.2	0.9	0.9	0.2	0.2
NI	19.2	18.5	20.2	18.6	19.7	19.5	20.7	21.2	21.3	20.2
Total	73.3	71.1	81.1	80.4	82.1	81.8	84.9	88.0	86.9	81.5

Table A2-13: 1-in-50 peak day demand – sensitivity 1

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Power	167.4	148.5	184.0	157.5	159.4	167.4	173.4	176.5	184.2	186.3
IC	67.0	67.8	82.1	82.7	82.4	82.0	81.5	81.0	80.3	79.0
Residential	57.0	57.0	56.4	55.2	53.2	51.1	48.9	46.7	44.6	42.4
Transport	0.1	0.1	0.2	0.3	0.6	0.7	0.8	0.9	0.9	1.0
Own Use	5.0	4.9	5.1	5.1	5.2	5.1	5.3	5.2	5.1	5.0
Sub total	296.5	278.3	327.8	300.7	300.7	306.4	309.9	310.3	315.0	313.7
IOM	6.9	6.9	6.9	6.9	6.7	6.7	5.6	5.5	2.0	2.0
NI	121.0	121.9	131.1	119.6	123.1	131.1	122.8	138.8	131.3	142.1
Total	424.4	407.0	465.7	427.2	430.6	444.3	438.4	454.6	448.3	457.7

Table A2-14: Maximum daily supply volumes

GWh/d	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
Corrib	33.8	33.5	28.2	25.6	22.3	19.4	17.6	15.3	13.7	11.7
Moffat	386.9	386.9	386.9	386.9	386.9	386.9	386.9	386.9	386.9	386.9
Biomethane	0.1	0.3	1.1	2.2	4.1	7.3	10.6	16.7	19.7	24.4
Hydrogen	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.5	4.4

Appendix 3: Transmission network modelling

The purpose of the hydraulic network modelling is to test the adequacy of the existing all-island transmission network for a forecast demand under a number of supply scenarios, establishing where pressures are outside acceptable operational boundaries or where there is insufficient capacity to transport the necessary gas. This section summarises the results of the network analysis carried out for this GFS.

Network analysis was carried out using hydraulic network modelling software, Pipeline Studio®. A single hydraulic model of the interconnector and ROI transmission systems[81] was constructed using Pipeline Studio®. This simulation software was configured to analyse the transient 24-hour demand cycle over a minimum period of three days to obtain consistent steady results.

In order to assess the system on days of different demand pattern, three demand day types were analysed for each supply scenario over a 10-year period to 2030/31;

- 1-in-50 year winter peak day
- Average year winter peak day
- Average year summer minimum

These demand days, which were generated from the gas demand forecast, have been chosen as they represent the maximum and minimum flow conditions on the transmission system.

The ability of the ROI transmission system to accommodate the forecast gas flow requirements was validated against the following criteria;

- Maintaining the specified minimum and maximum operating pressures at key points on the transmission systems;
- Operating the compressor stations within their performance envelopes; and
- Ensuring gas velocities do not exceed their design range of 10 – 12 m/s.

Entry Point Assumptions

The main Entry Point assumptions are summarised in Table A4-1;

Table A3-1: Entry point assumptions

	Moffat	Corrib
Pressure (barg)	47.0[82]	Up yo 85.0
Gross Calorific Value (MJ/scm)	39.8[83]	37.7
Max Supply (mscm/day)	35	4.7

81 NI transmission system is not included in the modelling. NI is treated as a demand at Twynholm, Scotland.
82 Anticipated Normal Off-take Pressure (ANOP).
83 Figure based on average historic values.

As per the existing Pressure Maintenance Agreement (PMA), National Grid is required to provide gas at a minimum pressure of 42.5 barg at Moffat for flows up to 26 mscm/d. They have also advised a higher Anticipated Normal Off-take Pressure (ANOP) pressure for Moffat of 47 barg (i.e. the expected pressure under normal circumstances).

Glossary

AA	Appropriate Assessment
AD	Anaerobic Digester
AGI	Above Ground Installation
ALARP	As Low as Reasonably Practicable
ANOP	Anticipated Normal Offtake Pressure
BER	Building Energy Rating
BETTA	British Electricity Trading and Transmission Arrangements
CAM	Capacity Allocation Mechanism
CAP	Climate Action Plan
CCGT	Combined cycle gas turbine
CCS	Carbon Capture & Storage
CCUS	Carbon Capture Utilisation & Storage
CEF	Connecting Europe Facility
CGI	Central Gas Injection
CHP	Combined heat and power
CNG	Compressed Natural Gas
CO2	Carbon dioxide
CPS	Carbon Price Support
CRU	Commission for Regulation of Utilities
DD	Degree Day
DECC	Department of the Environment, Climate and Communications
DM	Daily Metered
DRI	District Regulating Installation
EC	European Commission
ENTSOG	European Network of Transmission System Operators for Gas
ENTSO-E	European Network of Transmission System Operators for Electricity
ESRI	The Economic & Social Research Institute
ESIPP	Energy Systems Integration Partnership Programme
EU ETS	European Emission Trading Scheme
EWIC	East West Interconnector
EU	European Union
FDI	Foreign Direct Investment
FSR	Functional Specification and Requirements
GB	Great Britain
GCS	Generation Capacity Statement
GDP	Gross Domestic Product
GFS	Gas Forecast Statement
GHG	Greenhouse Gas
GNI	Gas Networks Ireland
GRAZE	Green Renewable Agricultural & Zero Emissions
GTMS	Gas Transportation Management System
GTSC	Gas Technical Standards Committee
GWh	Gigawatt hour
GWhe	Gigawatt hour (electric energy)
GWh/d	Gigawatt hours per day
GWh/yr	Gigawatt hours per year
GWhe/yr	Gigawatt hours of electric energy per year
HGV	Heavy Goods Vehicle
HUGE	Hydrogen Utilisation Green Energy
I-SEM	Integrated Single Electricity Market Project
I/C	Industrial & Commercial
IC	Interconnector
ICT	Information & Communications Technology
IDA	Industrial Development Agency
IE	Ireland
IED	Industrial Emissions Directive
IMF	International Monetary Fund
IP	Interconnection Point
IOM	Isle of Man
ISCC	International Sustainability and Carbon Certification
KEL	Kinsale Energy Limited
KM	Kilometre
LDM	Large Daily Metered
LGV	Light Goods Vehicle
LNG	Liquefied Natural Gas
MEA	Manx Electricity Authority
MOP	Maximum operating pressure
Mscm/d	Million standard cubic metres per day
MW	Megawatt
MWh	Megawatt hour
NDM	Non-Daily Metered
NDP	Network Development Plan
NECP	National Energy & Climate Plan
NEEAP	National Energy Efficiency Action Plan
NGV	Natural Gas Vehicle
NI	Northern Ireland
NOx	Nitrogen Dioxide
NSAI	National Standards Authority of Ireland
NTS	National Transmission System
NUIG	National University of Ireland Galway
NZEB	Nearly Zero Energy Buildings
OCGT	Open Cycle Gas Turbine
OECD	The Organisation for Economic Co-operation and Development
PC4	Fourth Price Control
PC5	Fifth Price Control
PCI	Project of Common Interest
PfG	Programme for Government
PMA	Pressure Maintenance Agreement
PSO	Public Service Obligation
RAB	Regulated Asset Base
RED	Renewable Energy Directive
RES	Renewable Energy Source
RES-E	Renewable Energy Source use in Electricity
RES-T	Renewable Energy Source use in Transport
RGFI	Renewable Gas Forum Ireland
ROI	Republic of Ireland
SEA	Strategic Environmental Assessment
SEAI	Sustainable Energy Authority of Ireland
SEM	Single Electricity Market
SLGN	Sligo Local Gas Network
SME	Small and Medium Enterprise
SNSP	System Non-Synchronous Penetration
SOx	Sulphur Dioxide
TEN-E	Trans-European Networks in Energy
TEN-T	Trans-European Networks in Transport
TES	Tomorrow's Energy Scenarios
TPER	Total Primary Energy Requirement
TSO	Transmission System Operator
TWh/yr	Terawatt hours per year
TYNDP	European 10-Year Network Development Plan issued by ENTSOG
UK	United Kingdom
UK ETS	UK Emission Trading Scheme
UCD	University College Dublin
UNFCCC	United Nations Framework Convention on Climate Change

Gas Networks Ireland

The main contact details for
Gas Networks Ireland are:

General Enquiries
1800 464 464

Lines open Monday to Friday 8am – 8pm
and Saturday 9am – 5.30pm

24 Hour Emergency Service
1800 20 50 50

networksinfo@gasnetworks.ie

@GasNetIRL
gasnetworks.ie

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