Rialtas na hÉireann
Government of Ireland

Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems

Consultation

19 September 2022

Prepared by the Department of Environment, Climate and Communications
www.decc.gov.ie

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1. Introduction

Ireland's energy system is going through a period of transformational change and as we transition to a net-zero emissions future we must ensure the pathway of decarbonisation is underpinned by affordability, and security in how we access and use energy in our everyday lives. Having a reliable source of energy is vital for consumers to have confidence in the transition to a net zero emissions future[1].

Energy is an essential part of life and a basic human need. As a society, having a continuous and stable supply of energy is extremely important. The International Energy Agency (IEA) defines energy security as 'the uninterrupted availability of energy sources at an affordable price[2]'.

The most secure energy is the energy that we do not use and therefore, energy efficiency should always form part of our response to energy security. Despite significant improvements in recent years, Ireland's energy usage per dwelling remains higher than the EU average[3]. In 2019, 80% of Irish homes and other buildings had a BER rating of C or lower[4]. Climate Action Plan 2021 set a target of completing 500,000 residential retrofits to achieve a B2 BER/cost optimal equivalent or carbon equivalent and includes a National Retrofit Plan focused on delivering the necessary increase in upskilling, reskilling and apprenticeship supports for residential retrofitting[5]. The supports provided to increase the levels of energy efficiency and uptake of solar PV for households increases security of supply for the residential sector. There needs to be fundamental improvements in energy efficiency across all sectors to ensure that Ireland has a secure energy system.

Energy import dependency is a simple and widely used indicator of a country's energy security, with indigenous sources of energy being considered as more secure than imported energy. Ireland is one of the most energy import dependent countries in the EU with oil making up the largest share of energy imports i.e., 100 % of oil and 71% of natural gas was imported in 2021[6]. Ireland's dependency on gas imports is increasing as our supply of indigenous gas from the Corrib Gas Field declines. Another consideration is diversity of

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[1] https://assets.gov.ie/205779/2cead2c2-e83b-4e15-bd02-a90804e0674a.pdf

[2] https://www.iea.org/areas-of-work/ensuring-energy-security

[3] https://www.seai.ie/publications/Energy-in-the-Residential-Sector-2018-Final.pdf

[4] https://publicpolicy.ie/papers/the-energy-efficiency-of-irish-homes/

[5] https://assets.gov.ie/224574/be2fecb2-2fb7-450e-9f5f-24204c9c9fbf.pdf

[6] https://www.seai.ie/data-and-insights/seai-statistics/key-publications/national-energy-balance/

supply i.e., how many different sources of energy supply are available to Ireland. It is important to understand the variety within Ireland's energy portfolio and whether disruption to one primary source of energy could be amply compensated by another source of supply.

The share of renewable energy within a country's energy mix also has an important bearing on its energy security of supply. In order to reduce its import dependency, Ireland must increase the level of energy from a diverse number of renewable energy sources. In addition to having a diverse renewables portfolio, the development of storage, demand side response and interconnection will support Ireland's decarbonisation and energy security agenda.

In February 2022, Russia invaded Ukraine causing a humanitarian crisis that has displaced millions of Ukrainian citizens. The war has also directly impacted on Europe's energy system and caused other impacts on the global energy market as Europe seeks to phase out its dependency on Russian energy imports. The war has led to significant impacts on energy prices and is increasingly impacting on Europe's energy security.

As we decarbonise our energy system, demand for electricity will increase and our demand for natural gas will decrease. However, as we transition away from other fossil fuels, the dependence of the electricity system on natural gas (particularly at times of low wind) and the peak demand for natural gas are both expected to increase.

There are risks to the security of Ireland's energy supply which are generally low-probability but high-impact events. These risks can be characterised by their likelihood or probability of occurrence, their severity, and their duration. The Government needs to consider the likelihood of these potential risks materialising and how to use the resources available to mitigate against the likely impacts on citizens and businesses.

2. Purpose of this Consultation

The Department of the Environment, Climate and Communications is undertaking a review of the security of supply of Ireland's electricity and natural gas systems. Detailed research has been carried out to inform this review. Supporting technical analysis has been conducted by Cambridge Economic Policy Associates Ltd (CEPA). The technical analysis consisted of three different stages of work, (i) the identification and examination of risks, (ii) the identification of options to address these risks, and (iii) the appraisal of these options. There are two reports of the technical analysis which are available to be reviewed in conjunction with this consultation document. This consultation will help inform the

Department's review of the security of energy supply of Ireland's electricity and natural gas systems and the outcome of the review will be brought to Government for its consideration.

Security of Electricity Supply – Winter Periods 2022/23 to 2025/26

A programme of work is being conducted, led by the CRU with assistance from EirGrid and the Department, on short- to medium-term electricity security of supply. This work programme of work is **outside the scope of this review.** It is of critical importance that this programme is carried out to ensure Ireland's electricity security of supply over the coming years.

Further information on the CRU Programme of Actions can be found at: https://www.cru.ie/cru-publishes-security-of-supply-information-note/.

An update to the Programme was published on 29 June 2022 at:

CRU202264-Electricity-Security-of-Supply-Programme-of-Work-Update.pdf

It is essential that there is a clear understanding of the reasons why this situation has occurred and that any identified shortcomings are addressed. Therefore, Mr Dermot McCarthy (Former Secretary General to the Government and the Department of the Taoiseach) has been engaged to conduct an independent review to understand how the present situation occurred. This independent review will identify learnings which may be relevant to strengthening policy, capacity, governance, and operational effectiveness in this area.

The Terns of Reference of this independent review are published at:

gov.ie - Independent Review - Security of Electricity Supply (www.gov.ie)

2.1 Materials Considered

There are a number of reports on energy security which are relevant when considering Ireland's energy security. The energy landscape is evolving rapidly and some of the considerations in these reports may no longer be based on up-to date information. However, they provide a range of insights and analysis on energy security matters.

(i) In 2018, a Long-Term Resilience Study[7] completed by Gas Networks Ireland and EirGrid was published. This study examined Ireland's resilience to a prolonged

[7] https://www.gasnetworks.ie/docs/corporate/gas-regulation/Long-Term-Resilience-Study-2018.pdf

gas disruption and made recommendations on how Ireland can future-proof its gas supply.

(ii) In 2020, SEAI produced a report on Energy Security in Ireland which gave a comprehensive overview of energy security related issues and considered energy security in a holistic manner[8].

(iii) EirGrid All Island Generation Capacity Statement 2021 – 2030[9].

(iv) Gas Networks Ireland Network Development Plan 2021[10].

(v) MaREI / Wind Energy Ireland - Our Climate Neutral Future Zero by 50 (March 2021)[11].

(vi) International Energy Agency - Net Zero by 2050: A Roadmap for the Global Energy Sector (October 2021)[12].

(vii) CCAC letter on Energy Security and Climate Action of 12 April 2022[13].

(viii) British Energy Security Strategy (April 2022)[14].

(ix) International Energy Agency: Security of Supply in Electricity Markets: Evidence and Policy Issues (June 2022)[15].

(x) Institute of International and European Affairs: Europe's Long Winter: Escaping the Energy Crisis (July 2022)[16].

3. Public Consultation Process

All responses and submissions from interested parties are welcome and will be considered as part of the review. The results of the review will be brought to Government for consideration. Please note that DECC does not intend to respond to individual submissions. Submissions with the subject 'Review of the Security of Energy Supply of Ireland's Electricity

[8] https://www.seai.ie/publications/Energy-Security-in-Ireland-2020-.pdf

[9] 208281-All-Island-Generation-Capacity-Statement-LR13A.pdf (eirgridgroup.com)

[10] GNI-2021-Network-Development-Plan.pdf (gasnetworks.ie)

[11] file:///C:/Users/ann.marie/Downloads/Our-Climate-Neutral-Future-Zero-by-50-Skillnet-Report-March-2021-Final-2.pdf

[12] Net Zero by 2050 - A Roadmap for the Global Energy Sector (windows.net)

[13] CCAC Letter to Government.pdf (climatecouncil.ie)

[14] British energy security strategy - GOV.UK (www.gov.uk)

[15] SecurityofSupplyinElectricityMarketsEvidenceandPolicyIssues.pdf (windows.net)

[16] https://www.iiea.com/publications/europes-long-winter-escaping-the-energy-crisis

and Natural Gas Systems Consultation' can be made to the following email address: energyconsultation@decc.gov.ie or by post to:

Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems Consultation,

Wholesale Electricity and Gas Policy Division,

Department of Environment, Climate and Communications,

29-31 Adelaide Rd,

Dublin 2,

D02 X285.

The closing date for submissions is **28 October 2022 at 5.30pm**.

Please note that responses to this consultation are subject to the provisions of the Freedom of Information Act 2014 (FOI), Access to Information on the Environment Regulations 2007-2018 (AIE) and the Data Protection Act 2018.

Please also note that we intend to publish the contents of all submissions received to our consultations on our website. We will redact personal data prior to publication. In responding to this consultation, parties should clearly indicate where their responses contain personal information, commercially sensitive information or confidential information which they would not wish to be released under FOI, AIE or otherwise published.

Full details can be found in our Data Privacy Notice gov.ie - Privacy policy (https://www.gov.ie/en/help/privacy-policy/).

4. Ireland's Electricity and Natural Gas Systems

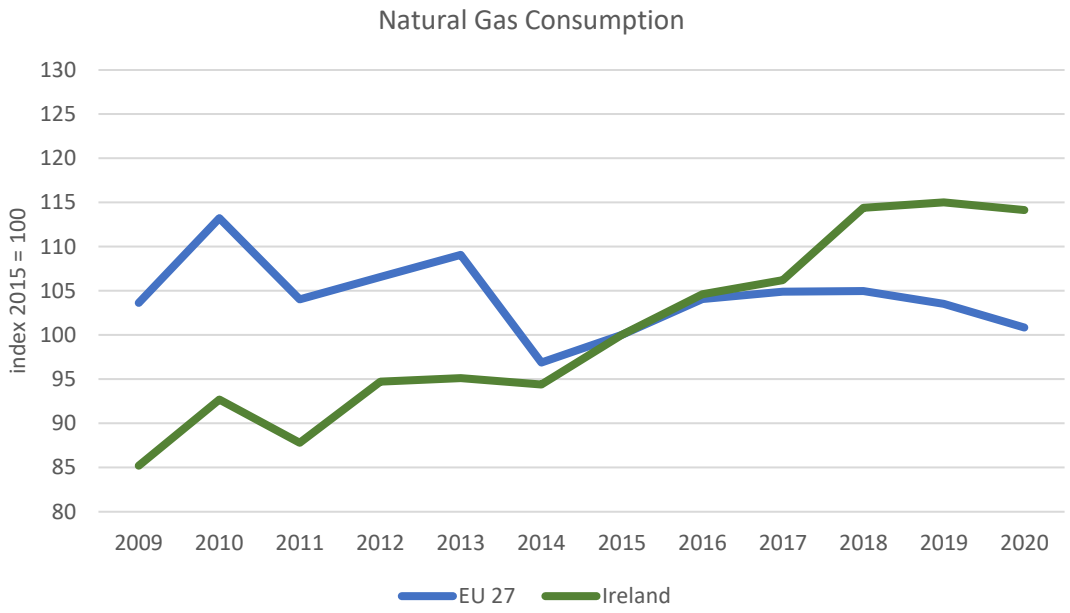
This section provides background information on Ireland's demand and supply for gas and electricity. This information illustrates Ireland's historic gas and electricity demand and supply and also shows the current grid operator forecasts for future demand and supply from both system operators. It should be noted that the forecasted information in this section comes from Gas Networks Ireland's 2021 NDP and EirGrid's All-Island Generation Capacity Statement 2021 – 2030. Both of these documents were written prior to the introduction of REPowerEU and the recent Government sectoral emissions ceiling agreement. Therefore, the gas and electricity forecasts do not include the REPowerEU commitments or the sectoral ceiling emission agreement which contains targets for 2GW of hydrogen and 5.7TWh of

biomethane. Higher than anticipated gas and electricity demand puts pressure on Ireland's ability to reach its climate targets as set out in the Climate Action Plan. This section also provides information about the Irish electricity and natural gas systems and the energy system of our nearest neighbour, the UK.

4.1 Ireland's Natural Gas Demand and Supply

Ireland's consumption of natural gas has increased in recent years, largely driven by the increased demand for electricity and some increases in industrial load. The natural gas consumption growth in Ireland is above the EU average as illustrated in the graph below.

Figure 1. Comparison of EU and Irish Natural Gas Consumption Growth

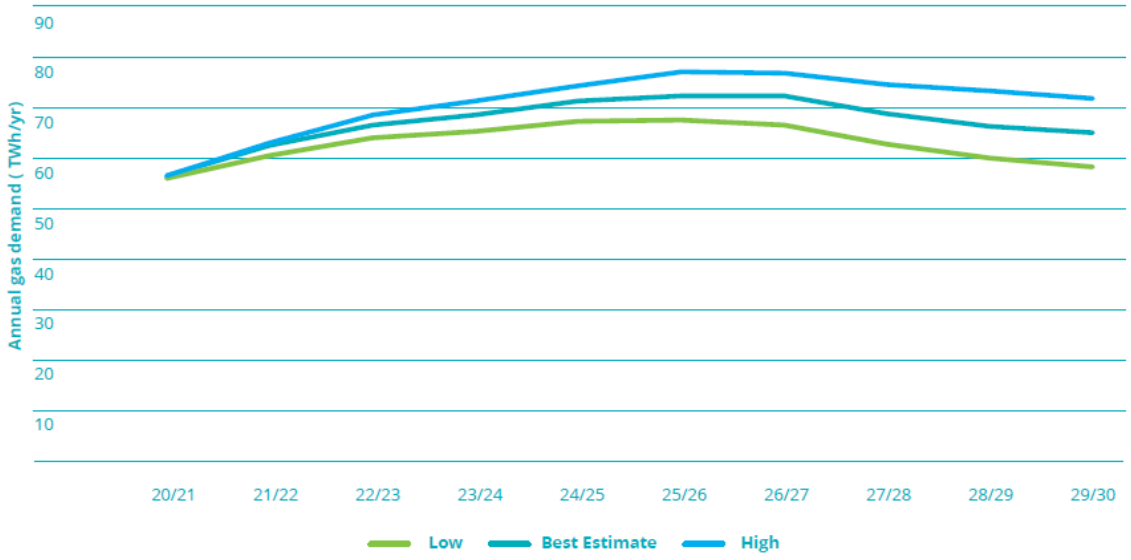


Source: Graph based on data from Eurostat.

Ireland's import dependency for natural gas has increased consistently over recent decades with rising demand and reducing production from the Kinsale and Seven Heads gas fields, which have now ceased production. The arrival of the Corrib gas field in late 2015 reversed this trend, though the dependency rate is increasing again as the Corrib gas field depletes.

Gas Networks Ireland's 2021 Network Development Plan (NDP), in its Best Estimate demand scenario, forecasts annual ROI gas demand growth of 15% between 2020/21 and 2029/30. This strong growth is due to increasing power generation gas demand (driven by increasing electricity demand and other thermal plant closures) and increasing industrial and commercial sector gas demands.

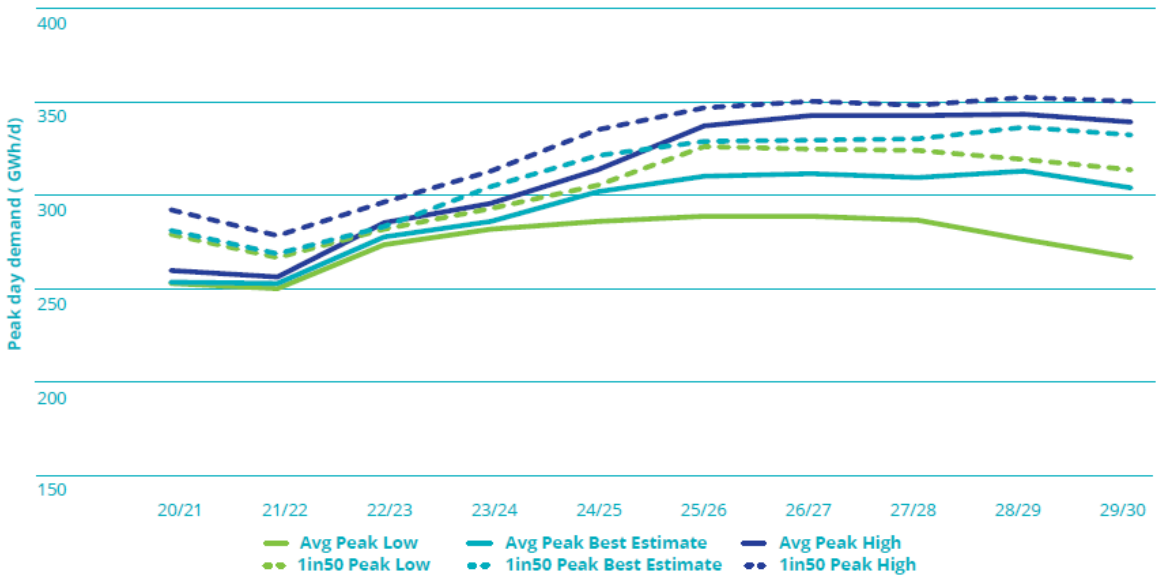
Figure 2. Total Annual ROI Gas Demand



Source: Gas Networks Ireland Network Development Plan 2021

Gas Networks Ireland forecast increases in the average and 1-in-50 peak day demands when there is limited wind generation available during cold winter peak day demand periods leading to a reliance on thermal generation, especially gas-fired generation.

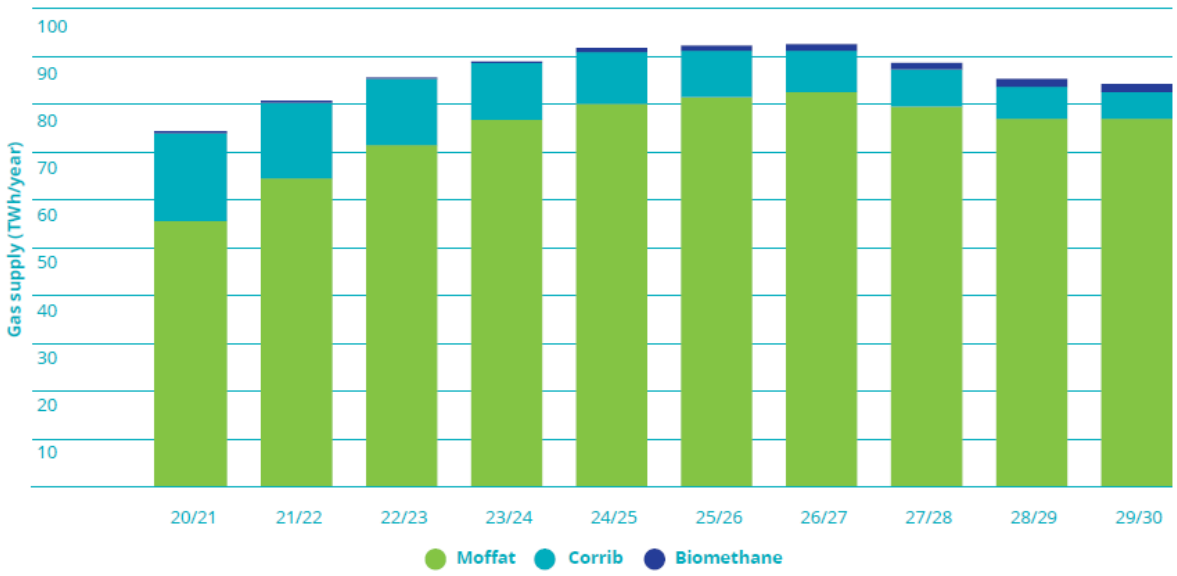
Figure 3. Peak Day Gas Demand Forecast



Source: Gas Networks Ireland Network Development Plan 2021

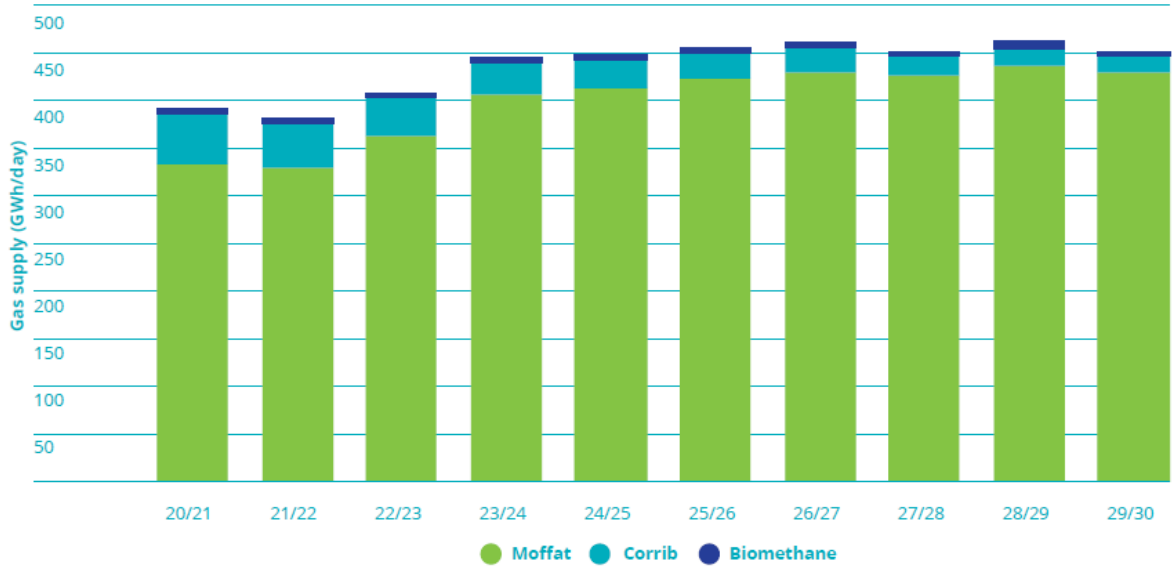
Gas Networks Ireland forecast that imports of gas through the Moffat interconnector system from UK will remain the dominant source of gas in Ireland and will increase as the Corrib gas fuel gradually depletes.

Figure 4. Annual Gas Networks Ireland System Gas Supply Forecasts – Best Estimate Scenario



Source: Gas Networks Ireland Network Development Plan 2021

Figure 5. 1-in-50 peak day gas supply forecast – Best Estimate scenario

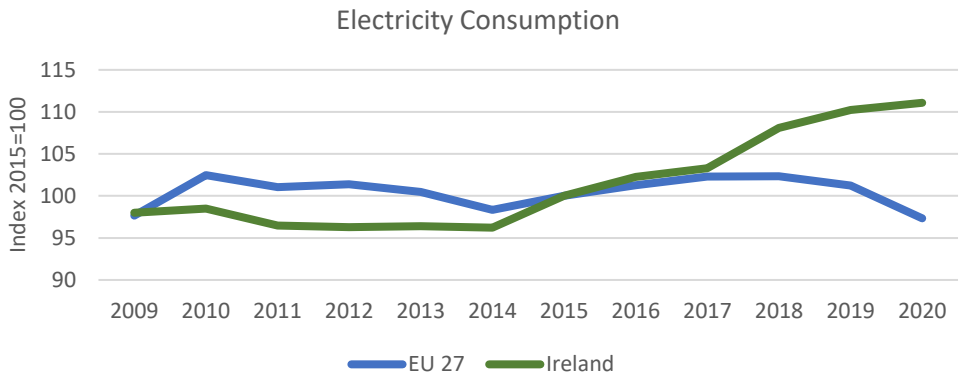


Source: Gas Networks Ireland Network Development Plan 2021

4.2 Ireland's Electricity Demand and Supply

Ireland's electricity consumption growth rate has increased rapidly in recent years and is significantly higher than the EU average as illustrated in the graph below.

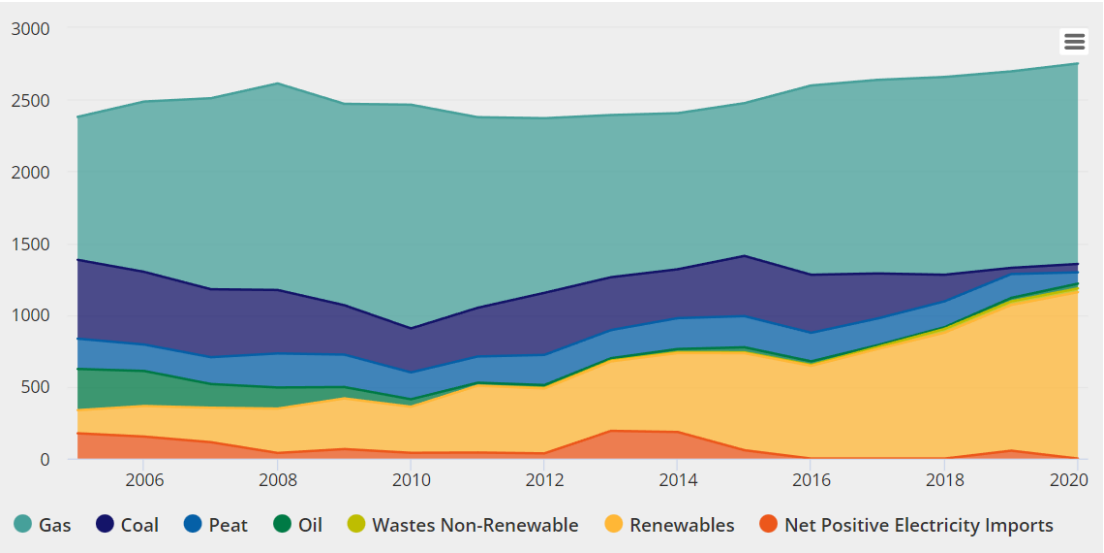
Figure 6. Comparison of Ireland and EU Historic Electricity Demand Growth



Source: Graph based on data from Eurostat.

The sources of electricity generation have evolved considerably over the last ten years with the two dominant sources currently being natural gas and renewables. The share of electricity from renewable energy increased almost six-fold between 2005 and 2020, from 7% to 42%, an increase of 35 percentage points in 15 years. This increase in the share of renewables came despite a rise in the total demand for electricity. Electricity production from coal and oil has increased since 2019, driven by rising gas prices, higher electricity demand and a higher outage rate of gas plant.

Figure 7. Sources of Electricity Generation in Ireland

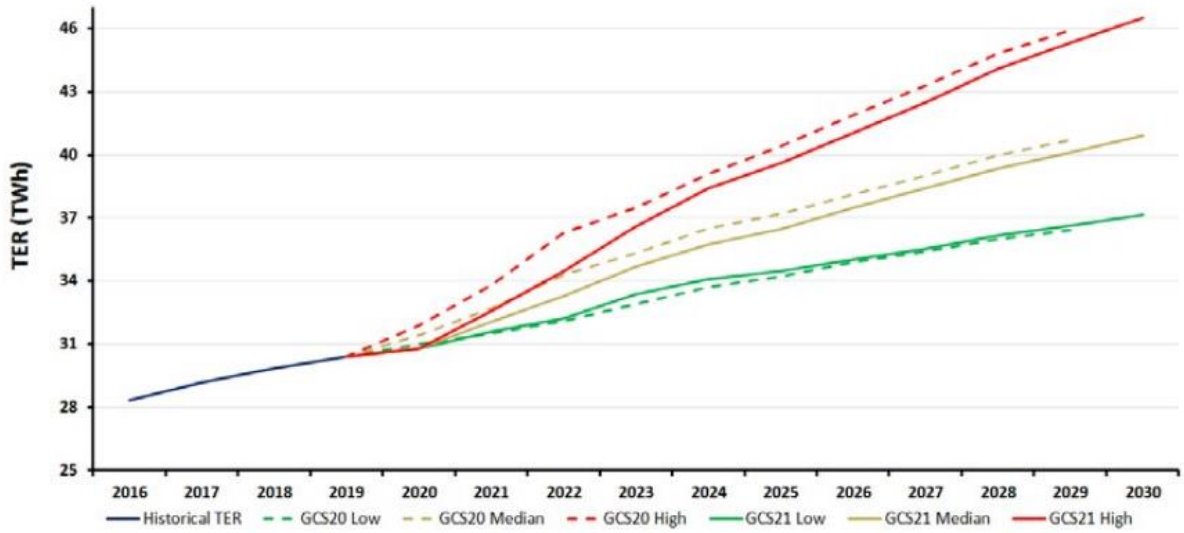


Source: www.seai.ie

Ireland's electricity demand has been increasing consistently over the last five years, despite the Covid-19 pandemic. The following graphs illustrate the total electricity forecast for 2021

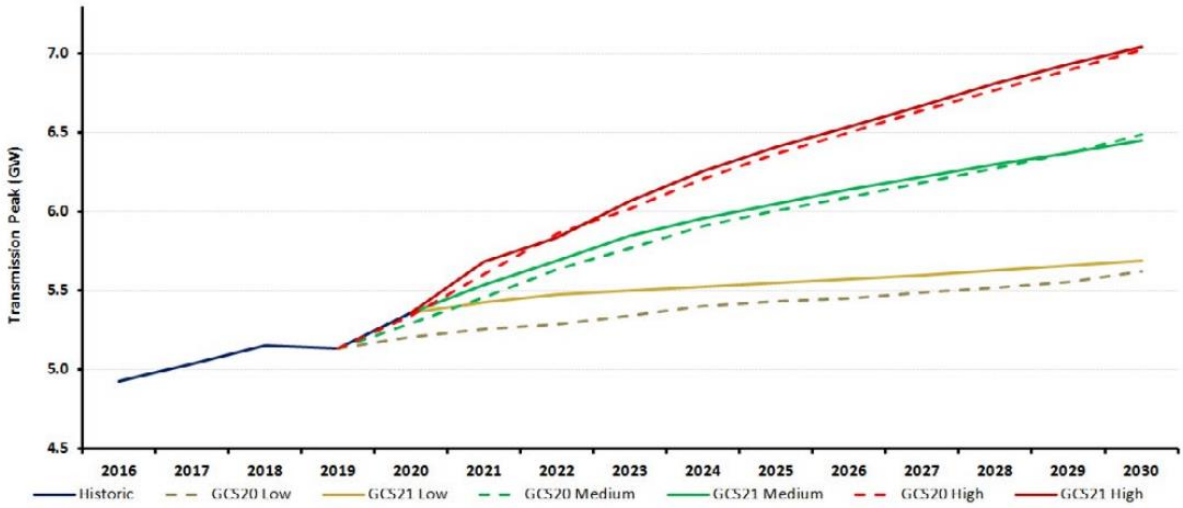
to 2030 and the transmission peak forecast for the same time period as set out in EirGrid's Generating Capacity Statement published in September 2021.

Figure 8. Ireland's Total Electricity Forecast 2021 – 2030



Source: EirGrid's All-Island Generation Capacity Statement 2021 - 2030

Figure 9. Transmission Peak Forecast for Ireland 2021 – 2030



Source: EirGrid's All-Island Generation Capacity Statement 2021 – 2030

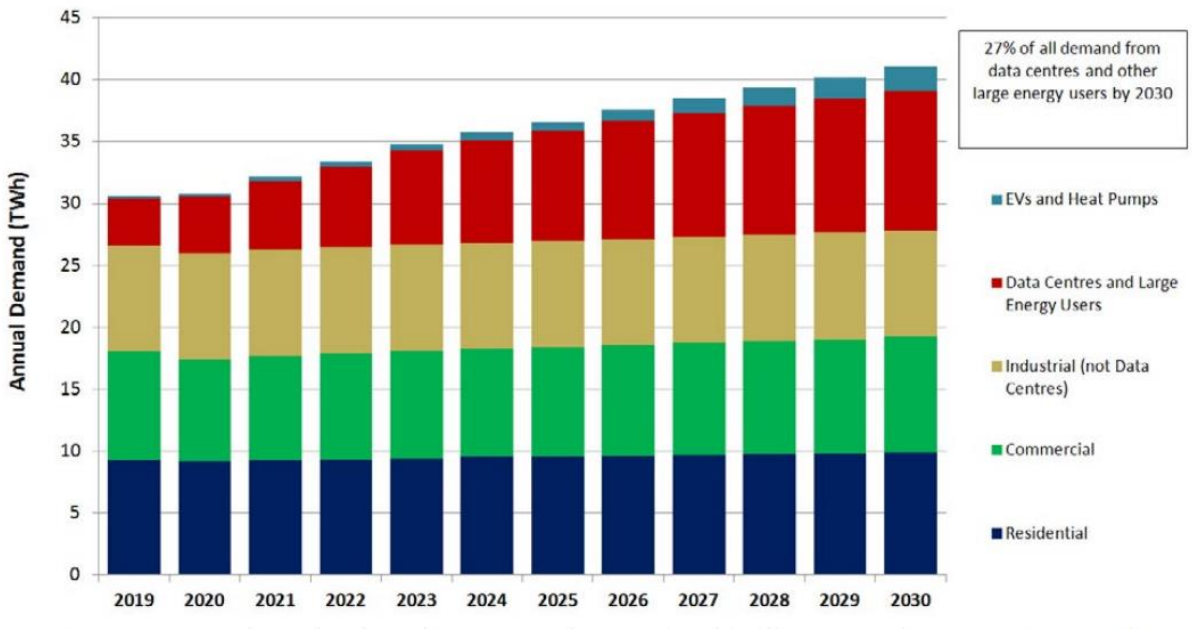
In Ireland, total electricity demand over the next ten years is forecast to continue to grow.

Climate Action Plan 2021 sets out the underlying drivers of changes in the forecasted electricity demand as:

- Data centres are forecast to continue to grow by up to ~9 TWh in 2030 (~23% of total demand).

- Transport electricity demand is forecast to grow (~23% p.a.) as a result of fast uptake of EV charging.
- Electrical heating in industry will increase by more than 2.5 times in 2030 from 2017 levels.
- Building energy efficiency improvements from an extensive retrofit programme will moderate the growth in electricity demand from new heat pumps in buildings.

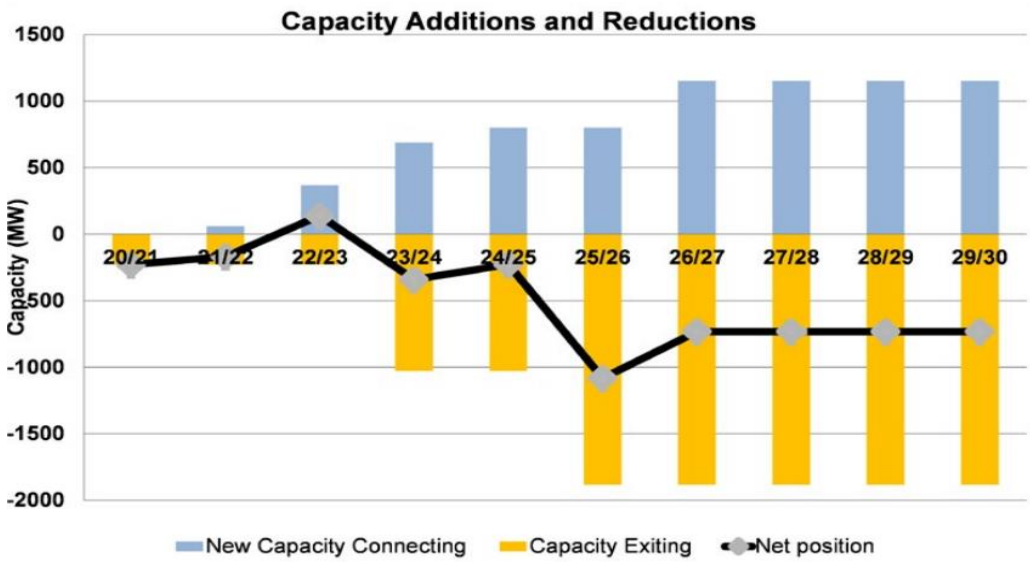
Figure 10. Illustration of an approx. split of electricity demand into different sectors for the Ireland Median Demand scenario, 2021 – 2030



Source: EirGrid's All-Island Generation Capacity Statement 2021 – 2030

The electricity system in Ireland is continuing to evolve as more and more renewables are being brought onto the system. A number of existing generators are due to close over the next ten years and there are plans to connect new generating units. The following graph illustrates the trajectory for the capacity exiting the system and the new capacity that is expected to connect. This graph shows also shows the next position of the capacity and the need for additional new capacity to connect to the system.

Figure 11. Balance between generation units leaving and joining the electricity system in Ireland



Source: EirGrid's All-Island Generation Capacity Statement 2021 – 2030

4.3 Irish Electricity System

Ireland has an extensive electricity transmission network, which is operated at high voltage for the transmission of large volumes of electricity from generation stations to bulk supply points near its main towns and cities. The electricity distribution network is operated at medium to low voltage to bring electricity to homes and businesses across Ireland. EirGrid is Ireland's electricity transmission system operator with responsibility for planning and operating the electricity transmission network. ESB Networks is licensed to build, operate, maintain and develop the electricity distribution network in Ireland. Each organisation has distinct roles with regard to the electricity transmission and distribution networks. ESB Networks builds and maintains the transmission system while EirGrid manages the power flows and ensures that the transmission system can meet increases in electricity demand e.g., by facilitating more energy from renewable sources[17]. The electricity distribution system has circa 151,000 km of overhead lines and circa 25,000 km of underground cables[18] while the transmission system has 6,504 km of overhead lines and 456km underground cables[19]. Electricity in Ireland can be generated from many sources of energy such as wind, solar,

[17] https://www.esbnetworks.ie/who-we-are/our-networks

[18] https://www.esbnetworks.ie/docs/default-source/publications/esb-networks-distribution-annual-performance-report-2020.pdf?sfvrsn=2350308e_5

[19] https://www.esbnetworks.ie/who-we-are/our-networks

bioenergy (renewable energy sources) or natural gas, oil, coal (non-renewable sources of energy). Renewable energy sources such as wind and solar are intermittent and require a complementary flexible source of power such as conventional generation, batteries, demand side response, interconnection, or other solutions to back them up and ensure that the electricity system remains in operation and stable even when these sources of energy are not available. Ireland has an electricity interconnector to the UK, the East West Interconnector (EWIC) and an interconnector to Northern Ireland. Planned infrastructure includes the North-South Interconnector, two new electricity interconnectors (one between Ireland and the UK and the second between Ireland and France) and other network reinforcements identified by EirGrid and ESB Networks.

Figure 12. Map of Ireland's Electricity Network.

Source: EirGrid[20]

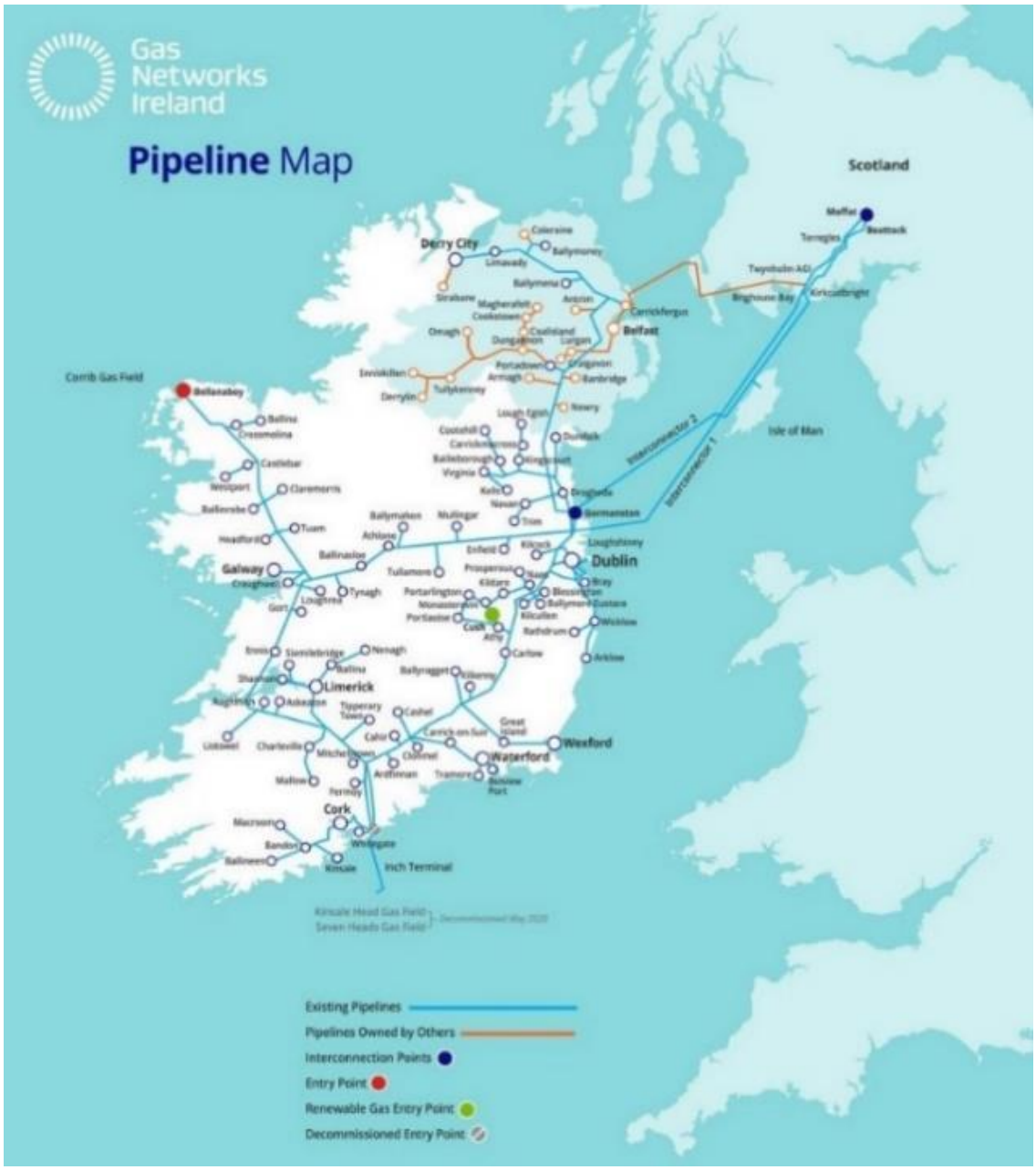
[20] https://consult.eirgrid.ie/consultation/public-consultation-shaping-our-electricity-future/chapter/introduction

4.4 Irish Gas System

The Irish gas system is made up of a transmission network and a distribution network with both systems being operated by Gas Networks Ireland (the national gas transmission and distribution operator). The transmission high pressure gas network consists of steel pipelines, gas installations and compressor stations. This network transports large volumes of gas to the distribution network and large users such as power stations. The distribution medium and low-pressure gas network consists of polyethylene (PE) pipelines, gas installations and service lines which deliver gas to homes and businesses. The gas network consists of over 14,500km of gas pipelines, of which approximately 2,500km are high pressure steel transmission pipelines, and the network has over 700,000 connected customers. A pipeline connects Ireland's gas grid to Northern Ireland's grid.

The Corrib Gas Field at Bellanaboy is an indigenous source of gas supply and meets circa 25% of Ireland's gas demand. The balance of Irish gas demand (circa 75%) is met by two subsea interconnectors from Scotland (IC1 and IC2) which brings gas to Ireland. UK sources its gas from its own indigenous supply, from pipelines with Norway, interconnectors from Belgium and the Netherlands, and from the global gas market via Liquified Natural Gas (LNG) imports. Ireland does not have any gas storage or LNG facilities. There has been significant investment in the onshore Scottish gas assets which Gas Networks Ireland owns and operates. In 2018, Gas Networks Ireland completed the twinning and commissioning of the Ireland to Scotland gas interconnector. This project consisted of a new 50km gas pipeline between Cluden and Brighouse Bay in Scotland which results in a complete twinning of the two gas interconnectors between Ireland and the UK.

Figure 13. Map of Ireland's Gas Network.



Source: Gas Network Ireland's Website[21]

4.5 UK Energy System

In the UK, the main energy networks are the gas and electricity systems, which are designed to transport energy from remote locations over a considerable distance to demand centres. National Grid is the electricity system operator for Great Britain (GB), and it owns and maintains the high-voltage electricity transmission network in England and Wales. GB has

[21] https://www.gasnetworks.ie/corporate/company/our-network/pipeline-map/

undersea electricity interconnections to northern France (HVDC Cross-Channel), Norway (North Sea Link), Northern Ireland (HVDC Moyle), Isle of Man (Isle of Man to England Interconnector), Netherlands (Britned), Belgium (Nemo link) and Ireland (East West). The Electricity System Operator for Northern Ireland, SONI, is the electricity Transmission System Operator for Northern Ireland with responsibility for matching supply and demand for power and for planning for the future of the electricity grid[22]. In parallel, Northern Ireland Electricity Networks is the owner of the electricity transmission and distribution networks in Northern Ireland with responsibility for maintaining, repairing, and constructing the electricity grid. NIE Networks supplies electricity to over 900,000 customers including homes and businesses[23]. There is an All-Island wholesale electricity market in Ireland, the Single Electricity Market (SEM), which has been in operation since November 2007 and is operated by SONI and EirGrid through the Single Electricity Market Operator (SEMO).

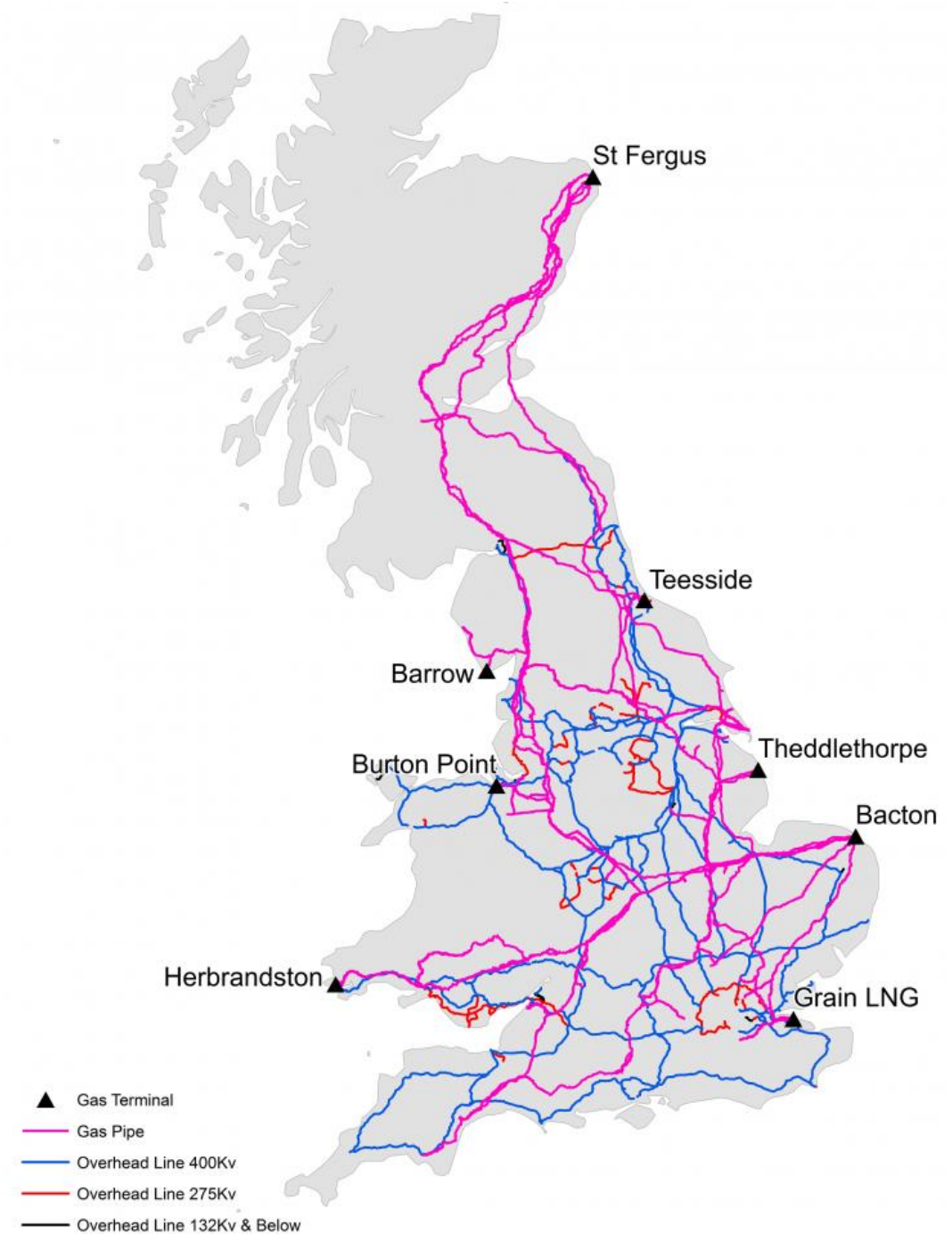
National Grid also owns and operates the national gas transmission system in GB. In the mid-1960s exploration of the UK Continental Shelf (UKCS) led to several discoveries of large gas fields providing the UK with an indigenous source of natural gas. The UK has nine gas terminals with the two largest being (i) St Fergus (UKCS and Norwegian gas supplies) and (ii) Bacton (UKCS and Continental gas supplies) gas terminals. While the UK has previously been self-sufficient in gas supplies, by 2005 it was a net gas importer. The UK relies on gas interconnectors with Norway and Europe for some of its gas supplies as well as LNG terminals and gas storage. There is an LNG gasification terminal at the Isle of Grain and a further two LNG terminals at Milford Haven (Dragon and South Hook). The UK has eight gas storage facilities, the largest three storage facilities are Stublach, with a capacity of 400 million cubic meters and then Aldbrough and Hornsea, with capacities of 320 and 300 million cubic meters, respectively[24]. There are four gas transmission pipelines in Northern Ireland i.e., (i) the SNIP (Scotland to Northern Ireland pipeline), (ii) the BGTP (Belfast Gas Transmission pipeline), (iii) NWP (Northwest Pipeline) and (iv) SNP (South North Pipeline). There are three distribution licensed areas within Northern Ireland i.e., (i) the Greater Belfast and Larne distribution licensed area, (ii) the Ten Towns distribution licensed area and (iii) the West distribution licensed area.

[22] https://www.soni.ltd.uk/about/soni/

[23] https://www.nienetworks.co.uk/about-us

[24] https://www.statista.com/statistics/549039/gas-storage-space-uk/

Figure 14. Gas and Electricity Systems in Great Britain



Source: National Grid website.[25]

[25] https://www.nationalgrid.com/gas-transmission/land-and-assets/network-route-maps?page=1

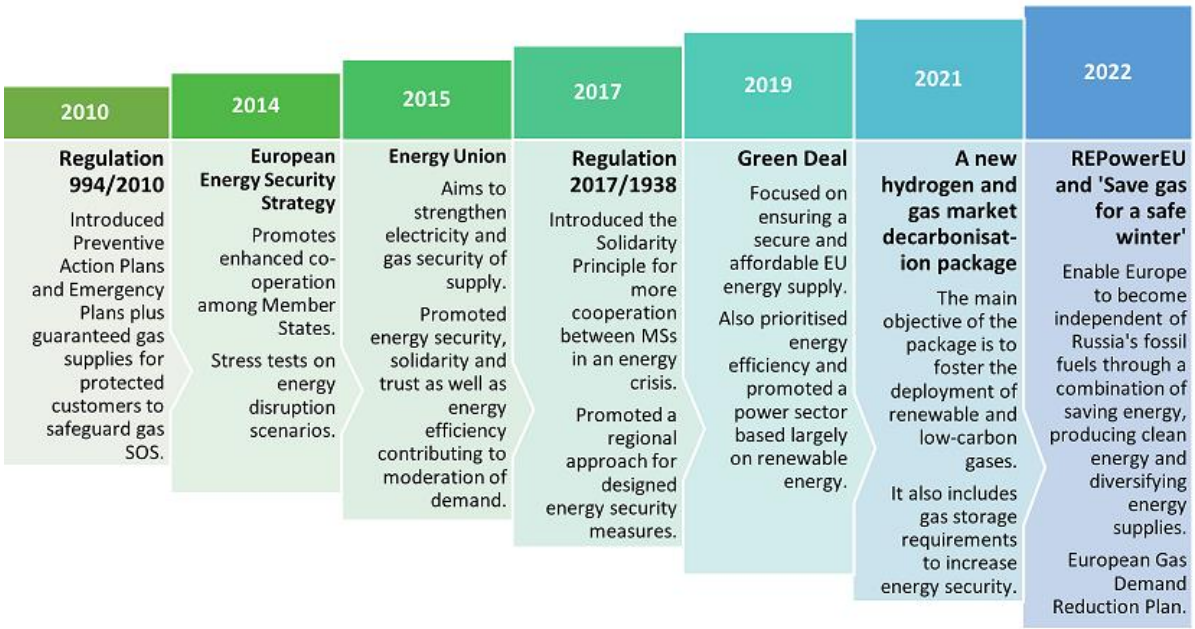
5. Policy Context

There is considerable policy at an EU and national level that addresses energy security, particularly pertaining to potential supply disruptions but also with respect to the EU's clean energy transition.

5.1 EU Policy

Energy policy is a shared competence between the EU and its Member States[26]. The EU has developed policies on an incremental basis to address energy security with relevance to both geopolitics and its climate action ambitions.

Figure 15. EU energy security related policy from 2010 – 2022



Following a number of Russian-Ukrainian gas disputes in 2006 and 2009, the European Commission (EC) introduced Regulation 994/2010 in an attempt to safeguard the security of the gas supply. This Regulation was published in 2010 and introduced a requirement for all Member States to have Preventive Action Plans and Emergency Plans to deal with crises and to ensure that gas supplies are guaranteed to households and other protected customers for a certain period of time. This Regulation also introduced an Infrastructure Standard asking Member States to ensure that the necessary measures are taken so that in the event of a disruption to the single largest gas infrastructure, that the capacity of the

[26] Energy Supply and Security (europa.eu)

remaining gas infrastructure[27] is able to satisfy total gas demand on a day of exceptionally high gas demand i.e., a one in twenty gas day[28]. In the past, Ireland met the infrastructure standard on a regional basis in conjunction with the UK. Since the end of the transition period on 1st January 2021 when the UK voluntarily ceased to be a member of the EU, Ireland has not been in a position to meet the infrastructure standard[29], although there has been no change to Ireland's physical gas infrastructure. It should be noted that the UK is no longer required to provide solidarity to Ireland during natural gas supply disruptions as set out in article 13 of Regulation 2017/1938[30]. Nonetheless, detailed arrangements are in place between Ireland and the UK in the event of a gas supply emergency and these are set out later in this document.

European Energy Security Strategy

In 2014, the EC published a European Energy Security Strategy which outlined some short-term goals and long-term measures to mitigate some of the security of supply risks. The Strategy promoted enhanced co-operation among Member States and among the short-term measures were a series of stress tests undertaken by 38 countries focused on two simulated energy-disruption scenarios linked to Russian gas imports[31]. In 2015, the EC published a 'Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate' which provided a renewed EU policy focus on energy under the Juncker Commission. Strengthening security of supply in electricity and natural gas was one of the aims of the energy union as was delivering legislation to help attain the goals of the 2030 EU climate and energy framework. Energy security was also one of the five inter-related dimensions of the energy union strategy.

Regulation 2017/1938 on Security of Supply

In 2017, the Commission introduced a new regulation to further strengthen gas security by introducing a new and more efficient approach to preventing and mitigating possible security

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[27] This should be determined using the N – 1 formula as set out in point 2 of Annex 1 of the Regulation.

[28] Regulation (EU) No 994/2010 of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security of gas supply and repealing Council Directive 2004/67/ECText with EEA relevance (europa.eu)

[29] Energy Policy – Wednesday, 4 Nov 2020 – Parliamentary Questions (33rd Dáil) – Houses of the Oireachtas

[30] REGULATION (EU) 2017/ 1938 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of 25 October 2017 - concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994 / 2010 (europa.eu)

[31] https://www.seai.ie/publications/Energy-Security-in-Ireland-2020-.pdf

of gas supply crises. This Regulation introduced a solidarity principle whereby, as a last resort, neighbouring Member States would help ensure gas supplies to households and essential social services in the case of a severe crisis. To ensure better coordination between Member States there was a shift from a national approach to a regional approach when designing security of supply measures. This approach was also seen as helping to increase the effectiveness of security of supply measures and reducing their costs for EU citizens. The CRU was designated the competent authority with responsibility for implementing the provisions of Regulation 2017/1938 in March 2018.

European Green Deal and the Fit for 55 package

The European Green Deal was launched in December 2019 and focused on three key principles which are:

- ensuring a secure and affordable EU energy supply
- developing a fully integrated, interconnected and digitalised EU energy market
- prioritising energy efficiency, improving the energy performance of our buildings and developing a power sector based largely on renewable sources

As part of the European Green Deal and European Climate Law, the EU has set itself a binding target of achieving climate neutrality by 2050. As an intermediate step towards this goal, the EU has increased its 2030 climate ambition and is committed to cutting emissions by at least 55% by 2030. The Fit for 55 package is a set of proposals to revise and update EU legislation with the aim of ensuring that EU policies are in line with the climate goals of reducing net GHG emissions by at least 55% by 2030. In December 2021, the EC published a new hydrogen and gas market decarbonisation package entitled "Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen". This package is about fostering renewable and low carbon gases and extending the scope of the gas security of supply regulation to renewable and low carbon gases which will help to decrease Europe’s dependency on imports of fossil fuels. Member States and the European Parliament are engaging on the details of this package.

REPower EU and ‘Save Gas for a Safe Winter’

In March 2022, the EC proposed an outline of a plan to make Europe independent from Russian fossil fuels well before 2030, starting with gas, in light of Russia's invasion of Ukraine. The plan also outlines a series of measures to respond to rising energy prices in Europe and to replenish gas stocks for next winter. Revisions to the security of supply regulation with regard to enabling more effective gas storage have been agreed and will help

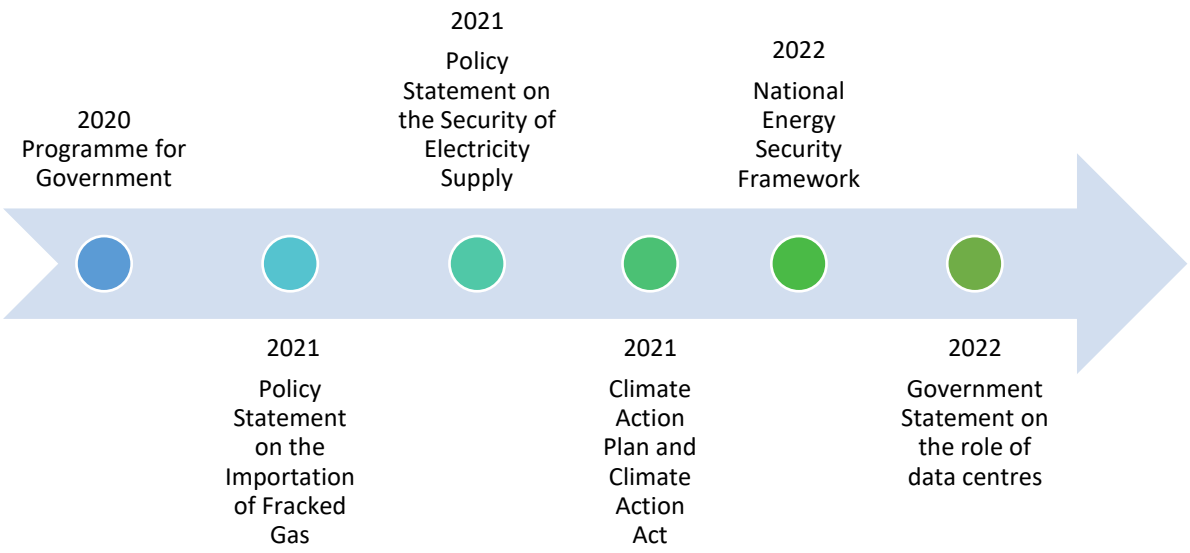
ensure a high filling level of gas storage at the beginning of the heating period in the EU to compensate for potential temporary shortages of gas supplies[32]. Ireland has been granted an exemption from the gas storage requirement because it is not directly connected to another EU Member State. The REPowerEU Plan, published in May 2022, focuses on saving energy, producing clean energy and diversifying the EU's energy supplies. This plan sets out a series of measures to rapidly reduce the EU's dependence on Russian fossil fuels and to accelerate the green transition, while increasing the resilience of the EU-wide energy system.

On 20 July 2022, the EC published its 'Save gas for a safe winter' communication which sets out what needs to be done in the event of further disruptions or even a complete cut off of gas supplies from Russia. On foot of this communication, the European Council agreed a regulation for a voluntary gas demand reduction of 15% in all Member States for Winter 22/23 and an additional mandatory target (in case of a supply crisis) which does not apply to Ireland, as it is not connected to another Member State.

5.2 National Policy

There have been significant changes to Irish climate and energy policy over the past three years as the Government has increased Ireland's ambition with regard to emission reductions, energy efficiency and renewable energy. The measures for energy efficiency and deployment of renewables are also consistent with increasing our energy security.

Figure 16. Recent Irish policy developments relevant to energy security.



[32] https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_6685

Programme for Government and Climate Action and Low Carbon Development (Amendment) Act 2021

The Programme for Government – Our Shared Future was published in 2020 and highlights that energy will play an essential role in creating a strong and sustainable Irish economy over the next decade. Having a reliable supply of safe, secure and clean energy is crucial to achieving a phase-out of fossil fuels. The Programme for Government (PfG) commits Ireland to a 51% reduction in total emissions by 2030, relative to 2018 levels, and to achieving net zero emissions by 2050. The PfG also included a commitment to ending the issuing of new licences for exploration and extraction of gas and sets out the Government's opposition to the importation of fracked gas. The Climate Action and Low Carbon Development (Amendment) Act 2021 makes Ireland's target of net zero emissions by no later than 2050 legally binding and placed the cessation of new oil and gas exploration licences on a statutory footing. This Act also embeds the process of carbon budgeting into law, requiring the Government to adopt a series of economy-wide five-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis. The economy-wide carbon budget programme took legal effect from 6 April 2022. Sectoral emissions ceilings, which set the maximum amount of GHG emissions that are permitted in a given sector of the economy during each five-year carbon budgetary period, were approved by Government on 29 July 2022.

2021 Climate Action Plan

Climate Action Plan 2021 sets out the actions needed to deliver Ireland's climate targets and sets indicative ranges of emissions reductions for each sector of the economy. The plan sets a range of targets across the electricity sector including:

- Increasing the share of electricity demand generated from renewable sources to up to 80% by 2030.
- Deliver circa 2 GW of new flexible gas-fired power stations in support of a high variable renewable electricity system.
- Delivery of three new transmission grid connections or interconnectors to Northern Ireland, Great Britain, and the EU.
- Ensure that 20-30% of system demand is flexible by 2030.

The Government is committed to the implementation of all actions within Climate Action Plan 2021 (CAP). These actions include achieving targets such as up-to 80% renewable electricity, 845,000 passenger Electric Vehicles, 98,500 zero emission vans and heavy

goods vehicles, 500,000 residential dwellings retrofitted to at least a B2 BER standard, deployment of zero emission heating in 400,000 existing homes and a district heating target of circa 2.7 TWh[33]. The circular economy and climate action are inherently interlinked. The Circular Economy and Miscellaneous Provisions Act 2022 was signed into law in July 2022 and underpins Ireland's shift from a "take-make-waste" linear model to a more sustainable pattern of production and consumption. The aim of the Act is to retain the value of the resources in our economy for as long as possible so that we can significantly reduce our greenhouse gas emissions[34].

Exploration Authorisations

A Policy Statement on Petroleum Exploration and Production in Ireland published in August 2022 replaced the 2019 Policy Statement in order to reflect the current policy and legislative position of the Government on Petroleum Exploration and Production, and to provide clarity to stakeholders in relation to future authorisations which may be granted under legislation.

It outlines the commitment, contained in the Programme for Government – Our Shared Future, to end the issuing of new licences for the exploration and extraction of gas on the same basis as the decision taken in 2019 by the previous Government in relation to oil exploration and extraction. The Policy Statement confirmed that whilst no new authorisations for new exploration will be granted, existing authorisations are not affected by this change. Holders of existing authorisations can continue to apply to progress through the standard licensing lifecycle stages towards a natural conclusion, which may include expiry, relinquishment, or production. Any applications for follow-on authorisations or applications to undertake offshore activities under an authorisation are subject to Ministerial consent and must continue to meet environmental, technical, and financial criteria as appropriate. Applications for petroleum authorisations are assessed against a number of criteria in accordance with Section 9A of the Petroleum and Other Minerals Development Act, 1960 (as amended) and Section 3 of the Licensing Terms for Offshore Oil and Gas Exploration, Development and Production.

Policy Statement on the Importation of Fracked Gas

In May 2021, the Government published a Policy Statement on the Importation of Fracked Gas[35], to meet its commitment in the PfG. The Policy Statement outlined that the security of

[33] https://assets.gov.ie/224574/be2fecb2-2fb7-450e-9f5f-24204c9c9fbf.pdf

[34] https://www.gov.ie/en/press-release/4546a-landmark-circular-economy-act-signed-into-law/

[35] https://assets.gov.ie/135271/3226a65b-c49c-458e-9ab9-83b2d1196af2.pdf

supply review would inform whether it would be appropriate, or not, to develop LNG terminals in Ireland. It would also consider in a situation where a terminal might be developed, whether it should only be developed in respect of providing contingency supply in the event of a failure of Ireland's physical gas supply infrastructure. It also highlighted that it would not be appropriate for any LNG terminal developments to be permitted or proceed pending the outcome of this review of the security of energy supply of Ireland's electricity and natural gas systems. The Government also outlined that it would work with international partners to promote the phasing out of fracking within the wider context of the phasing out of fossil fuel extraction. It is foreseen that the outcome of the review of the security of energy supply of Ireland's electricity and natural gas systems would supersede the policy statement on the importation of fracked gas.

Policy Statement on Security of Electricity Supply

In November 2021, the Government published a Policy Statement on Security of Electricity Supply which outlined the key challenges to ensuring security of electricity supply such as having adequate electricity generation capacity, storage, grid infrastructure, interconnection and system services to meet both average and peak demand[36]. It is imperative that security of electricity supply is maintained throughout the transition to the target of up-to 80% of electricity consumption from renewable sources to ensure that consumers do not lose confidence in the transition. The Policy statement highlights the need for significant investment in additional flexible conventional electricity generation, electricity grid infrastructure, interconnection and storage in order to ensure security of electricity supply. Through this Policy Statement the Government approves the development of new conventional generation as a national priority and that it is appropriate that existing conventional electricity generation capacity should be retained until the new conventional electricity generation capacity is developed in order to ensure security of electricity supply. It is also appropriate for additional electricity and gas grid infrastructure, electricity interconnection and electricity storage to be permitted and developed to support renewable energy growth and the security of electricity supply.

National Energy Security Framework

In April 2022, the Government published the National Energy Security Framework. This Framework provides an overarching and comprehensive response to Ireland's energy security needs in the context of the war in Ukraine. Within the Framework document, the Government has focused on how it can support households and businesses, in particular

[36] https://assets.gov.ie/205779/2cead2c2-e83b-4e15-bd02-a90804e0674a.pdf

those most at risk of fuel poverty, and how to accelerate the country's shift to increased energy efficiency and indigenous renewable energy systems. The Framework also highlights the review of Ireland's electricity and natural gas security of supply as a key priority.

Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy

In July 2022, the Government published a new Statement on the Role of Data Centres in Ireland's Enterprise Strategy. Government policy seeks to enable the twin transitions of decarbonisation and digitalisation of Ireland's society and economy. It is important that these decarbonisation and digitalisation transitions are complementary and, therefore, this Statement sets out national principles to inform and guide future data centre development. Future data centres need to deliver strong economic benefits, have sustainable energy plans, and demonstrate a willingness to promote Ireland's national decarbonisation objectives. The Decarbonisation section of this Government Statement highlights the undesirability of "Islanded" data centres that would be powered mainly by fossil fuels. The key text outlines that "'Islanded' data centre developments, that are not connected to the electricity grid and are powered mainly by on-site fossil fuel generation, would not be in line with national policy. These would run counter to emissions reduction objectives and would not serve the wider efficiency and decarbonisation of our energy system. Growth in 'Islanded' data centres could result in security of supply risk being transferred from electricity to gas supply, which would be a significant challenge given Ireland's reliance on gas importation."

Nuclear Power

Nuclear powered electricity generation plants are prohibited in Ireland as set out in the provisions of section 18 of the Electricity Regulation Act, 1999, as amended. The Planning and Development Act 2000 does not allow for the development of nuclear installations and states that "Nothing in this Act shall be construed as enabling the authorisation of development consisting of an installation for the generation of electricity by nuclear fission"[37]. As stated by Minister for the Environment, Climate and Communications, the Government has no plans to revisit the prohibition on, or explore the development of, nuclear powered electricity generation in Ireland[38] and therefore it has not been considered in this review.

[37] https://revisedacts.lawreform.ie/eli/2000/act/30/revised/en/html#SEC37K

[38] Nuclear Plants – Tuesday, 30 Nov 2021 – Parliamentary Questions (33rd Dáil) – Houses of the Oireachtas

5.3 Climate and Energy Targets

Ireland has in place a range of targets which set the boundaries of our energy policy design. The EU had set climate and energy targets for 2030 which were being reviewed under the Fit for 55 package with the intention of increasing the targets. REPowerEU builds on the Fit for 55 proposals that were published last year and while it does not modify the ambition of achieving at least -55% net GHG emissions by 2030 and climate neutrality by no later than 2050, it does propose an amendment to raise the targets for energy efficiency and renewable energy to 13% and 45% respectively[39].

Figure 17. Evolution of Renewable Energy Targets

Source: Renewable energy targets (europa.eu)

The Government recently reached agreement the Sectoral Emissions Ceilings. The development of Sectoral Emission Ceilings and the introduction of Carbon Budgets were provided for in the Climate Action and Low Carbon Development (Amendment) Act 2021. The Ceilings set maximum limits on greenhouse gas emissions for each sector of the Irish economy to the end of the decade. The Sectoral Emissions Ceilings have been set for the electricity, transport, buildings, industry and agriculture sectors, delivering on a key Programme for Government commitment. The agreement commits additional resources for

[39] https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_3132

solar, off-shore wind, green hydrogen, agro-forestry, and anaerobic digestion to further accelerate the reduction of overall economy-wide emissions.

Table 1. Sectoral Emission Ceilings in Ireland

Sector	% Reduction by 2030	2018 vs 2030 Emission in MtCO2eq
Electricity	75	10.5 vs 3
Transport	50	12 vs 6
Buildings (Commercial and Public)	45	2 vs 1
Buildings (Residential)	40	7 vs 4
Industry	35	7.9 vs 5.1
Agriculture	25	23 vs 17.25
Other	50	2 vs 1

Source: Government announcement [40]

5.4 Roles and Responsibilities

The Commission for Regulation of Utilities (CRU) has statutory responsibility to ensure security of electricity supply in Ireland as set out in section 28 of S.I. No. 60/2005[41]. It also has a duty to monitor security of electricity supply and to take such measures as it considers necessary to protect security of supply. The CRU is assisted in its statutory role by EirGrid, and they are required to report to the CRU in regard to security of electricity supply matters. EirGrid is the designated Transmission System Operator (TSO) in Ireland, with responsibility for maintaining security of supply and it is also responsible for system defence, emergency management and system restoration.

Regulation (EU) 2017/1938 sets out that “responsibility for the security of gas supply should be shared by natural gas undertakings, Member States, acting through their competent authorities, and the Commission, within their respective remits”. It also highlights that this shared responsibility requires very close cooperation between all the parties involved. Gas

[40] Government announces Sectoral Emissions Ceilings – setting Ireland on a pathway to turn the tide on climate change - MerrionStreet

[41] S.I. No. 60/2005 - European Communities (Internal Market in Electricity) Regulations 2005 https://www.irishstatutebook.ie/eli/2005/si/60/made/en/print#

Networks Ireland has been appointed as the National Gas Emergency Manager (NGEM) by the CRU to manage natural gas emergencies in Ireland and prepares the Natural Gas Emergency Plan (NGEP) as part of their role as the NGEM. The NGEP is part of the requirement on EU Member States to implement measures to safeguard security of gas supply as set out in Article 8 of Regulation 2017/1938. The Department of Environment, Climate and Communications is the Government Department responsible for the formulation of energy policy, including security of supply.

5.5 International Developments

As a result of Ireland's geographical location as a small island on the periphery of Europe, it is more limited in term of interconnection with neighbouring countries compared with countries in continental Europe. Ireland currently has two sources of gas supply, i.e., indigenous gas from the Corrib gas field and imported gas from its two subsea interconnectors with the UK. There is also a land-based pipeline connecting the gas systems in Ireland and Northern. In comparison to some of our European neighbours, Ireland has lower levels of diversity of conventional energy supply. However, Ireland does have significant renewable energy resources (in particular wind) and is investing in an expansion of renewables. Ireland is also applying a focus on energy efficiency e.g., an acceleration of renovation.

The following table highlights the various sources of gas supply among a number of neighbouring European countries. The UK, Netherlands, Belgium, France and Portugal all have gas storage facilities and LNG terminals in addition to interconnection with neighbouring countries to support their security of gas supply.

Table 2. Comparison of gas supply sources across six North-West European countries

Country	Indigenous Natural Gas Supply	Subsea Interconnection	Land Based Interconnection	LNG Imports	Gas Storage
Ireland	Indigenous supply from the Corrib gas field	Two subsea interconnectors with the UK	Ireland has land-based interconnection with Northern Ireland, but their gas supply also comes from the same UK source	X	X

UK	Indigenous supply from the North Sea	Subsea interconnectors with Belgium, the Netherlands and Norway	N/A	There is an LNG gasification terminal at the Isle of Grain and two LNG terminals at Milford Haven)	The UK has eight gas storage facilities,[42]
Netherlands	Indigenous supply from the Groningen gas field and other fields in the Netherlands, both onshore and offshore[43]	The Netherlands has a subsea interconnector with the UK called the Balgzand Bacton Line (BBL) pipeline which is bidirectional[44]	The Netherlands is connected to the gas networks of Belgium and Germany via numerous underground pipelines[45]	The Gas Access to Europe (GATE) LNG terminal on Maasvlakte, Rotterdam is a professional access gateway for LNG[46]	Gas storage facilities e.g., Energy Stock[47] where natural gas is stored in caverns found in subterrane an salt deposits
Belgium	X	Subsea pipelines bring gas from the United Kingdom and Norway[48]	Land based pipelines bring gas from the Netherlands and Germany	LNG Imports come through the Zeebrugge LNG Terminal	Belgium has an under-ground gas storage plant called Loenhout Storage[49]

[42] https://www.statista.com/statistics/549039/gas-storage-space-uk/

[43] https://www.gasunie.nl/en/gas-infrastructure/blog-247-energy/where-does-our-natural-gas-come-from#:~:text=Besides%20the%20Groningen%20field%2C%20we,countries%20in%20the%20Middle%20East.

[44] https://iea.blob.core.windows.net/assets/93f03b36-64a9-4366-9d5f-0261d73d68b3/The_Netherlands_2020_Energy_Policy_Review.pdf

[45] The Netherlands 2020 - Energy Policy Review (windows.net)

[46] https://www.gateterminal.com/en/gate-terminal/

[47] https://www.gasunie.nl/en/gas-infrastructure/gas-storage

[48] https://www.energuide.be/en/questions-answers/where-does-the-electricity-and-the-gas-used-in-belgium-come-from/4/#:~:text=The%20natural%20gas%20we%20use,form%2C%20via%20the%20Zeebrugge%20terminal

[49] https://www.fluxys.com/en/company/fluxys-belgium/infrastructure#:~:text=The%20gas%20system%20in%20Belgium,out%20between%202024%20and%202030

France	X	France has a subsea interconnector with Norway via Dunkerque	France is also connected to Belgium, Germany, Switzerland and Spain via land-based pipelines	France has four LNG terminals, two on the Mediterranean, one on the Atlantic and one on the North Sea[50]	France has several commercial natural gas storage facilities across the country in aquifers and salt caverns[51]
Portugal	X	X	Portugal is connected to Spain via Campo Maior and Valença do Minho[52]	Portugal imports gas via its Sines LNG terminal	Portugal has natural gas storage facilities at the Carriço under-ground facility (composed of six salt caverns) and LNG storage at the Sines terminal[53]

In the wake of the Russian invasion of Ukraine, European countries have been re-evaluating their current energy security of supply arrangements with a view to moving away from importing Russian gas. At an EU level, requirements are in place to increase gas storage levels in preparation for this winter and many countries are taking actions to increase their LNG capacity as an alternative supply source to Russian imports. For example, approval for the construction of Germany's maiden LNG import terminal project at Wilhelmshaven was recently granted. The operator will invest circa €65 million in the project and the German government has committed to chartering two FSRUs to be used at the terminal[54]. Gasunie, a Dutch energy company has chartered an FSRU from New Fortress Energy for its new LNG import terminal in Eemshaven which will add circa 8 billion m3 per year of new regasification capacity when completed. Gasunie are also developing a German LNG Terminal in Brunsbüttel and are expanding the Gate Terminal in Rotterdam to enable them to store an

[50] Natural Gas Security Policy – Analysis - IEA

[51] Natural Gas Security Policy – Analysis - IEA

[52] Portugal 2021 Energy Policy Review (windows.net)

[53] Portugal 2021 Energy Policy Review (windows.net)

[54] Global LNG Info - News Service

additional 1 billion m3 per year of LNG[55]. In addition, Finland and Estonia have agreed to collaborate on an LNG project. Finland has signed a ten-year charter agreement with Excelerate Energy for an FRSU that will provide flexible, reliable, and secure LNG supplies to Estonia and the Baltic Sea Region. This is a medium-term solution to address security of supply concerns. Finland is currently preparing port structures for the FSRU but as part of the cooperation agreement with Estonia the FSRU may be located in an Estonian port this winter in a situation where the Finnish port structures are not yet completed[56].

Coupled with actions to increase gas storage levels and LNG capacity, many countries are also moving forward with ambitious hydrogen strategies as a means of diversifying their energy mix and increasing their energy independence where hydrogen production is feasible. Germany, the Netherlands, Portugal and the UK have also published hydrogen strategies setting out their level of ambition to 2030 and beyond. In their hydrogen strategy, the Dutch have set out that it is essential to scale up production of green gas and hydrogen in order to meet the expected demand for zero carbon gases by 2050. They also highlight the crucial role of zero-carbon hydrogen in enabling the continued integration of wind and solar energy into the energy supply[57]. The Department of the Environment, Climate and Communications is prioritising its hydrogen strategy as per the National Energy Security Framework. A consultation on developing a hydrogen strategy for Ireland was published on the 12th of July with responses requested by the 2nd of September[58]. In addition, the Government has indicated its support for renewable gas such as biomethane in the 2021 CAP with a target of 1.6 TWh per annum of indigenous sustainably produced biomethane for injection into the gas grid by 2030 and a willingness to explore opportunities to produce further levels of biomethane above 1.6 TWh. Overall, the Government has committed to carrying out a work programme to identify a route to deliver 1-3 TWh of zero emissions gas (including green hydrogen). The sectoral emissions ceiling agreement included additional commitments for green hydrogen (an additional 2,000 MW) and anaerobic digestion (up to 5.7 TWh of biomethane) – to further accelerate the reduction of overall economy-wide emissions.

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[55] NFE and Gasunie sign FSRU deal for Dutch LNG terminal - Tank Storage Magazine

[56] Finland and Estonia sign FSRU deal with Excelerate to build Baltic Sea LNG hub (energyconnects.com)

[57] https://www.government.nl/binaries/government/documenten/publications/2020/04/06/government-strategy-on-hydrogen/Hydrogen-Strategy-TheNetherlands.pdf

[58] gov.ie - Consultation on developing a hydrogen strategy for Ireland (www.gov.ie)

'HyLIGHT – Leading Ireland's Green Hydrogen Transition'[59] is a three-year research project aiming to provide knowledge, data and tools to guide the sustainable implementation of hydrogen technologies in Ireland. This project explores hydrogen production, storage, deliver and demand to facilitate the delivery of hydrogen to all energy sectors through optimum investment opportunities. Ireland has significant offshore wind resources which could be used to produce hydrogen and contribute to Ireland's energy independence.

6. Technical Analysis – Part 1

The Department of the Environment, Climate and Communications engaged CEPA to carry out technical analysis to help inform the review of the security of supply of Ireland's electricity and natural gas systems. CEPA's technical analysis was carried out in a number of stages. The first stage was to identify and examine key risks, the next stage was identifying a long list of mitigation options and the final stage was appraising the mitigation options against a set of key criteria to identify a short list of appropriate mitigation options. After the Russian invasion of Ukraine, additional scenarios were requested as part of CEPA's technical analysis to understand the potential impact of a full suspension of all Russian pipeline exports of natural gas to European markets on Irish security of supply. While it was not possible to include all scenarios, the technical analysis is based upon a range of credible scenarios to broadly address the identified risks and mitigation options. The Department has taken into consideration (i) the technical analysis conducted by CEPA and (ii) other sources of research related to energy security when drafting this consultation document.

CEPA Modelling Assumptions

CEPA carried out its modelling on the basis of a number of assumptions relating to electricity and natural gas demand and supply. CEPA used the Low Demand scenario in Gas Network Ireland's 2020 Network Development Plan (NDP) as the baseline scenario for 2025 and extended this forecast by assuming the trend will remain the same to 2030. A number of adjustments were made to the residential and I&C gas demand to align them more closely to the PfG commitments. The power sector gas demand was determined as an output of CEPA's electricity market model. CEPA set the baseline level of electricity

[59] HyLIGHT - MaREI

demand for 2025 in line with the Median demand scenario developed by EirGrid and SONI in the All-Island Generation Capacity Statement (GCS) for 2021-2030.

In Gas Network Ireland's 2021 NDP, they highlighted both an increase in gas demand and a potential constraint arising at the compressor station installations in the latter years of the forecast horizon[60]. The increase in gas demand is mainly being driven by the power generation sector due to significant projected growth in electricity demand and the anticipated closure of certain non-gas fired thermal generators. In addition, this review also needs to consider the ongoing EirGrid and Gas Networks Ireland modelling for their respective 2022 GCS and the 2022 NDP. Although the 2022 GCS and NDP are both in progress, EirGrid and Gas Networks Ireland have provided indications that demand for both electricity and natural gas is increasing and therefore it is important to note the worst-case scenario, i.e., demand increases above and beyond what was considered in CEPA's technical analysis. In this respect CEPA recognise that the nature of the shocks identified are likely to be the same or at least very similar, although the extent of unserved demand would differ. The range of mitigations options would remain the same.

6.1 Electricity and Gas Security of Supply Risks

The technical analysis has considered electricity and gas security of supply risks in the context of demand side risks and supply side risks. Risks need to be considered in terms of their likelihood and impact. The likelihood of a risk refers to how probable it is that that event will occur while the impact of a risk is about estimating how much harm could be caused if the event occurred. The more likely or severe an event then the greater the risk associated with that event is.

6.1.1 Demand Side Risks

A demand side risk can occur where there is the possibility of sudden increases in energy demand over a relatively short period of time that cannot be met by corresponding increases in supply. Demand side risks are generally caused by weather-related events such as cold snaps or periods of low wind or a combination of these events.

[60] https://www.cru.ie/wp-content/uploads/2022/02/CRU202203-Gas-Networks-Ireland-Ten-Year-Network-Development-Plan-2021.pdf

Table 3. Demand Side Risks for Electricity and Gas

Risk	Description
Low Temperatures	Residential gas demand is expected to decline over the next decade. However, given the relationship between residential gas demand and temperature, any prolonged periods of low temperatures can have an impact on gas demand for the residential sector. The relationship between electricity demand and temperature is not as strong as for gas, however as more people switch to heat pumps this relationship will become stronger. Increases in EV uptake will increase the demand for electricity, but this is less likely to create a security of supply risk if charging can be primarily confined to off-peak time periods.
Low Wind Speeds	Low wind speeds can create a sudden increase in gas demand in the power sector which is a key demand side risk for gas. The power sector is the largest source of gas demand in Ireland, with gas fired power plants generating circa 50% of Ireland's electricity on average and accounting for 56% of total networked gas consumption. There is a strong link between the power and gas sectors so any changes in the power sector can have a significant impact on gas demand. Power sector gas demand can increase suddenly and substantially during periods of low wind speed as gas fired generation is called upon to cover the reduction in electricity generation from wind.
Significant increased demand from LEUs	Electricity demand is expected to increase significantly due to high levels of electricity demand from large energy users such as data centres. Data centres are expected to be the main driver of the projected rise in overall electricity demand.
Electrification of heat and transport	Electricity demand is expected to increase due to the electrification of heat and transport which will play an important role in decarbonisation as electricity is expected to displace oil and gas demand in the transport and heat sectors. Climate Action Plan 2021 sets out objectives and targets for the electrification of heating and transport, i.e., promote use of electric heat pumps or other low carbon technology in new and existing residential and commercial buildings, expand electrification of bus and rail fleets with 1,500 electric buses by 2030, update the public transport and public fleets to low emission alternatives and increase the number of EVs to circa 1 million by 2030. Together these targets will place significant demand increases on both the electricity and gas networks with associated risks.

Combined Demand Risk Events	There is a possibility that low wind speed and low temperatures could occur at the same time which would lead to very little wind generation and at the same time a much higher demand for gas due to the colder weather. This demand side risk for the gas sector could become a supply side risk for the electricity sector which would require greater volumes of gas for power generation. In addition, this risk could be further amplified by the fact that these low wind speed/low temperature events are likely to affect a wider geographical region i.e., not just Ireland but neighbouring countries too. There is a relatively high correlation between temperature in Ireland and in countries/areas of the North-Western European region.

6.1.2 Supply Side Risks

Supply side risks usually occur where there is the loss of supply from production or infrastructure facilities. Potential disruptions to supply can be caused by (i) infrastructure or technical risks such as an outage of network infrastructure facilitates, (ii) market risks such as expected imports being diverted to other markets due to sudden events and price responsiveness (this includes price risk rather than loss of physical supplies), and (iii) geopolitical risks such as when a key supply source becomes unavailable or significantly reduced due to global geopolitical events and/or natural disasters.

Table 4. Supply Side Risks for Electricity and Gas

Risks	Description
Gas Supply Side Risk – imports from the UK	Ireland currently imports approximately 75% of gas supply from the UK via two interconnector pipelines to the Moffat terminal in Scotland[61]. By 2030, it is expected that over 90% of all of Ireland's natural gas needs will be supplied via Moffat in Scotland. There are a number of ways in which Ireland could be exposed to a potential security of supply shock such as: (i) A disruption at Moffat could reduce supply and undermine Ireland's ability to meet its gas demand. (ii) The UK is a well interconnected but heavily import-dependent country that could face supply shocks from more distant countries in Europe which could impact gas supply availability to Ireland.

[61] Indigenous gas from Corrib currently provides 25% of Ireland's gas requirements, however the Corrib gas field will substantially decline over the next decade leaving Ireland more reliant on imports.

	(iii) In addition, the fact that the UK is no longer a member of the EU means that Ireland is no longer physically connected to the EU internal energy market. Although EU Member States are required under the 'solidarity principle' to share gas supplies with interconnected Member States in emergency situations, the UK is no longer bound by EU internal market rules[62]. However, Ireland already has detailed arrangements in place with the UK in the event of a gas supply shock[63]. (iv) Although overall gas demand is projected to fall, the peak day gas demand is expected to rise, particularly on cold winter days with low renewable electricity generation available. A potential future risk is an inability to meet this peak day demand through our import infrastructure. However, although one can never rule out an incident where there is a disruption to both gas interconnectors at the same time this is less likely.
Gas Supply Side Risk – Geopolitical risks	There are geopolitical risks that relate to the possibility of a major natural gas supply source becoming unavailable e.g., a disruption of Russian gas supplies to Europe (as seen over the last year), a disruption of LNG production or shipping routes and/or a disruption of gas supplies to Europe from regions such as North Africa and the Middle East. While gas supplies may technically be available during a geopolitical disruption, they would likely be available at lower volumes and/or higher prices. A geopolitical disruption to European gas supplies may also reduce the availability of electricity imports to Ireland due to more stressed electricity markets in neighbouring markets across north-west Europe which may reduce Ireland's ability to access electricity imports that could compensate for reduced access to European gas supplies.
Electricity Supply Side Risk – Capacity Deficits	Overall, the electricity system is facing a number of supply risks due to the expected increases in electricity demand and the need to

[62] The likelihood of gas shortages due to the UK exiting the single market framework could potentially be mitigated through bilateral arrangements between the Irish and UK Governments.

[63] There is a joint protocol for load shedding in gas supply emergencies between Gas Networks Ireland and National Grid. In the event of a Natural Gas Supply Emergency (NGSE) being declared by the Network Emergency Coordinator (NEC) in Great Britain, the interconnector system (IC1 and IC2) will be treated by National Grid in the same way as a Distribution Network in Great Britain. In the event of a curtailment on the UK National Grid Primary System supply to the Distribution Network and the interconnectors (i.e., the secondary systems), these would be curtailed equally.

	decommission some existing conventional power plants. While capacity deficits are predicted based on the expected demand increases and known plant retirements etc., Ireland already has a mechanism in place for addressing or preventing these deficits, which is known as the Capacity Remuneration Mechanism (the CRM). The CRM is based on competitive auctions intended to ensure that the lowest-cost capacity is delivered on the system. The CRU have recently published a review of the CRM carried out by EY and are consulting on the report.
Electricity Supply Side Risk – Low Availability of Wind Generation	Low availability of wind generation is an electricity supply risk and the fact that wind generation in Ireland has limited geographic diversity. In addition, weather patterns generating multi-day low-wind periods are a part of continental weather patterns and therefore could potentially affect the wider North- West Europe region leading to low availability of electricity from neighbouring countries that are also affected.

6.2 Shock Scenarios and the Russian Invasion of Ukraine

Five scenarios are considered covering a range of demand and supply disruption situations for both gas and electricity which are severe but realistic shocks for the Irish energy system. Some of these scenarios stress test the system with a combination of shocks occurring simultaneously. While scenario 4 and 5 represent the most severe shocks, they are perhaps the shocks with the lowest probability of occurrence. A description of each of the scenarios is set out in table 5 below.

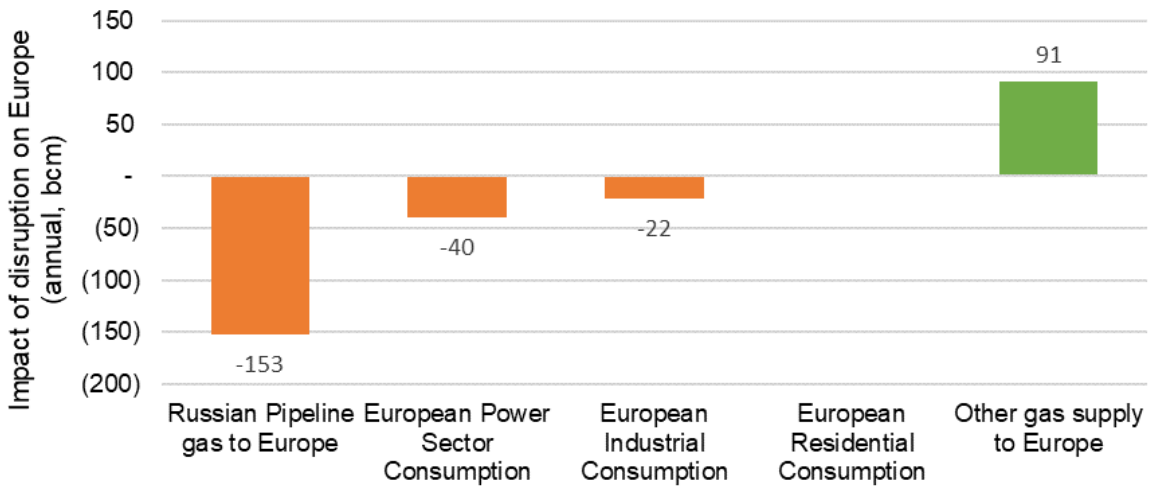
Table 5. A description of the five scenarios considered as a part of the electricity and gas security of supply review.

	Scenario Description
1.	A 2-week cold spell based on 1 in 20 temperatures + low wind and low solar. (Weather affects all of Ireland and neighbouring countries/interconnected markets)
2.	Scenario 1 + an outage of the largest electricity interconnector (EWIC in 2025 and Celtic IC in 2030) that last for 30 days.
3.	Scenario 1 + an outage of the IC2 gas interconnector which lasts for 30 days.
4.	A full disruption of gas supplies from GB assuming average winter conditions which lasts for 7 days.
5.	A longer disruption of gas supplies from GB which lasts 30 days assuming average winter conditions.

The Russian invasion of Ukraine is unprecedented in Europe in modern times and has created a humanitarian catastrophe that has displaced millions of Ukrainian citizens. Efforts have been consolidated across Government to address these urgent humanitarian issues. The invasion has highlighted key dependencies in Europe's energy systems and triggered a decision by the European Union to phase out its dependency on Russian energy imports as soon as possible.

The EU has up to recently imported around 40% of its total natural gas supplies from Russia via pipelines to Belarus, Germany, Finland, Turkey, the Baltic Countries, and Ukraine. The war in Ukraine has increased the risk that Russia might unilaterally suspend all of its exports of natural gas to Europe in response to Western sanctions as it has already halted exports of natural gas to Poland, Bulgaria, Finland, the Netherlands and Denmark. Following the Russian invasion of Ukraine, the scope of the electricity and gas security of supply review was expanded. Additional modelling was carried out to consider a technical assessment of the impact of a complete suspension of Russian pipeline exports of natural gas to European markets on Ireland's electricity and natural gas systems. The following graph illustrates the impact of a Russian gas disruption to Europe. The reduction in Russian pipeline gas to Europe must be met by a reduction of gas usage in Europe's power and industrial sectors as well as obtaining gas supplies from other sources.

Figure 18. Impact of the disruption on European gas flows under the central scenario (i.e., Shock Scenario 6, 2025) from CEPA's analysis.



Source: CEPA Analysis.

CEPA modelled the impact that having gas storage and LNG could have on Ireland with respect to addressing a disruption of Russian gas exports to Europe. A central scenario was

modelling with a number of sensitivities related to pain sharing and prioritisation of different sectors of customers.

There is a joint protocol for load shedding in gas supply emergencies between Gas Networks Ireland (Ireland) and National Grid (GB) that sets out the pain sharing between each system. In the event of a Natural Gas Supply Emergency (NGSE) being declared by the Network Emergency Coordinator (NEC) in GB, the Moffat Interconnector would be treated by National Grid in the same way as a Distribution Network in GB i.e., the Moffat Interconnector will be curtailed equally compared to a GB Distribution Network. It should be noted that Northern Ireland and the Isle of Man are both supplied by the Irish gas interconnection system.

If Ireland had additional sources of supply (e.g., through gas storage or LNG) then this would be considered when implementing the load shedding protocol in a situation where GB may need to reduce supplies to Ireland due to a supply disruption to the UK.

7. Technical Analysis – Part 2

As part of the technical analysis, CEPA identified a long list of security of supply mitigation options, 19 in total, and considered all options in the context of three key criteria which are outlined in table 6 below. **One of the assumptions that underpins the assessment that was carried out on the mitigation options is that Ireland's targets with regard to electrification of demand, the delivery of offshore wind capacity, geothermal energy, district heating and energy efficiency are broadly achieved by 2030**. The full long list of mitigation options that were considered and the rationale for their inclusion or exclusion from the short list is set out in the CEPA technical analysis reports.

Table 6. A description of the key criteria against which all mitigation options were considered.

Key Criteria	Description
Consistency with the Climate Action Plan	Considered the mitigation options in the context of whether they were consistent with the CAP, and with Ireland's decarbonisation ambitions more generally.
Security of Supply Impact	Considered the extent to which options could help mitigate the security of supply risks identified. Some mitigation options were packaged together to be more impactful, where the impact of an individual option would not have had a material impact on unserved demand.
Feasibility of Implementation	Considered the extent to which an option could be deployed at scale by 2025 and by 2030.

7.1 Gas Supply Mitigation Options

Gas Storage Facility

Gas storage facilities often operate by injecting gas into an underground reservoir when demand is low, usually during the summer, and withdrawing gas when demand is high, usually during the winter. In the past there had been a gas storage facility at the Kinsale gas fields but since its closure, Ireland no longer has gas storage capacity. It is assumed that this option would only operate as a strategic back-up in the event of a supply shock to help mitigate against unserved demand. The fact that it would be a non-commercial strategic back-up gas storage facility means that volumes of gas would be available for use at the onset of a security of supply event. Underground storage facilities are typically created in depleted hydrocarbon fields, aquifers, or salt caverns which are determined by geology. It is understood that the storage facility at Kinsale could in theory be reinstated in the future but would require major infrastructure investment and a very large investment in gas stocks to bring gas levels to a minimum level (known as cushion gas).

Floating LNG Terminal

Liquid natural gas (LNG) is natural gas which has been cooled down to a temperature that converts it from a gas to a liquid that is 1/600th of its original volume. LNG enables large volumes of natural gas to be stored and transported on specially designed vessels and therefore provides an alternative to transporting natural gas via pipeline. LNG provides access to alternative sources of natural gas. There is currently no import capability for LNG in Ireland. This mitigation option is based on a floating LNG storage and regassification unit (FSRU) which could be used on a non-commercial strategic basis. A FSRU is a non-fixed LNG storage facility with an onboard regassification plant that is capable of returning

imported LNG to its original gaseous state and then supplying it directly into the onshore gas network. FSRUs are usually moored at a jetty and can be refilled by other LNG vessels that dock alongside it. When the FRSU is no longer required, it can be transported to another location without leaving a large piece of stranded infrastructure behind. This mitigation option assumes that the LNG FSRU could be leased for a limited period of time, as a medium-term solution to mitigate more immediate security of supply concerns.

An alternative option could be to have an FSRU which is operated on a commercial basis but with a mandated level of strategic storage held at all times so that in the event of a supply shock a level of gas supply would be available immediately for the purpose of mitigating the supply shock. An emerging advancement is the possibility to design hydrogen-ready LNG facilities. For example, hydrogen can be stored as a gas using high pressure tanks or as a liquid requiring cryogenic temperatures[64]. A German utility is planning a 'hydrogen-ready' terminal for LNG in Germany which may incorporate a green ammonia terminal.[65]

Gas Mitigation Package (gas storage, renewable gas, green hydrogen and gas demand side response)

The long list of options included renewable gas and green hydrogen production as well as demand side response (DSR) measures for gas. While these are all valid options that are consistent with the 2021 CAP, on an individual basis they would not be able to mitigate against a significant supply shock given their current and expected scalability by 2030. Under this option, it is assumed that all hydrogen gas injections into the grid are developed by electrolysis from volumes of curtailed electricity generation. Therefore, these options are being combined with a strategic gas storage facility so that as a package they would provide a viable mitigation option. By adding renewable gas, green hydrogen and gas DSR to strategic gas storage they provide further security of supply mitigation relative to the standalone addition of the strategic gas storage facility which would only cover a proportion of gas demand.

Onshore Energy Storage Project

A hybrid of other options would be an onshore energy storage facility, used in a manner similar for oil, where Ireland has strategic reserves of gas in addition to its strategic oil reserves. Such a facility would liquify natural gas imported using the existing import facilities

[64] https://www.twi-global.com/technical-knowledge/faqs/what-is-hydrogen-storage

[65] https://www.rechargenews.com/energy-transition/uniper-resumes-plans-for-hydrogen-ready-german-lng-terminal-fortum-ceo/2-1-1179191

from Moffat and Corrib and store this gas for peak shaving and security of supply. This would not create diversity of supply and therefore would not create the potential for increases in gas demand. Such a solution is scalable by increasing the number of tanks to be used at the facility. The facility could also be designed to be hydrogen ready which would be a means of optimising the value of such a facility and contributing to the development of hydrogen in Ireland.

Natural Gas Demand Management

The CEPA report already provides for a significant drop in gas demand due to the ambition of our climate targets. This option goes beyond that to further limit growth in natural gas demand by setting targets in specific sectors such that no new gas connections would occur in that sector. While new connections are required for power generation to ensure our security of supply, other Member States have limited new connections to the gas network in other areas such as the residential sector.

7.2 Electricity Supply Mitigation Options

Additional electricity interconnection

The technical analysis already considers three planned electricity interconnectors in its assumptions i.e., an increase in transfer capacity between Ireland and Northern Ireland to 1,500 MW, the 700 MW Celtic interconnector to France by 2030 and a 500 MW interconnector to GB by 2030. This mitigation option also considers an additional 700 MW electricity interconnector between Ireland and France which is commissioned by 2030 which increases electricity transfer capacity between the two countries and provides an additional source of flexible electricity capacity. This additional electricity interconnector would further alleviate the potential for unserved electricity demand under a shock scenario except where there is a correlated shock event in neighbouring countries thus reducing the likelihood of electricity imports over the interconnector during the shock event. Interconnection can also provide flexibility for high-RES dispatch, thus helping to reduce curtailment and lower system emissions. The EU has set an ambition for each Member State to reach interconnection capacity of 15% of overall installed capacity. Ireland will already exceed this target when the planned interconnectors are commissioned, with 18% of overall installed capacity, and then the addition of another 700 MW of interconnection would increase this percentage to just under 22%.

Additional electricity storage – pumped hydro

Pumped storage hydropower (PSH) is a type of hydroelectric energy storage involving two water reservoirs at different elevations that can generate power as water moves from one to the other while passing through a turbine. Pumped storage plants are limited to suitable locations as they require specific topologies to operate effectively. This mitigation option assumes an additional 360 MW of pumped storage hydroelectricity capacity is brought online by 2030 in addition to the existing the Turlough Hill pumped storage plant which has an installed capacity of 292 MW. Additional pumped storage would provide another source of flexible capacity that may be more resilient to correlated shocks than interconnector imports. However, pumped storage is dependent on reservoir levels and in the event of an unexpected shock the pumped hydro may not be in a position to respond to this shock for a sustained period. Having additional pumped storage would help to enable a flexible energy system that incorporates high levels of RES generation.

Additional generation capacity – dispatchable low carbon

There is some biomass generation capacity in Ireland, but it is limited. The Edenderry plant in Co. Offaly is capable of using both biomass and peat for power generation and from 2024 will operate exclusively on biomass. There are also a number of CHP plants that burn biomass to meet heat requirements while exporting surplus power to the grid. Indigenous biomass supply can act as a substitute for fossil fuels in generation. This mitigation option assumes an additional 450 MW dedicated biomass plant in 2025 and that an additional 25 MW biomass plant is operational by 2030. A power generating plant that uses biomass as its source of fuel provides a low-carbon source of electricity which contributes to RES penetration targets. It also provides a means of diversifying away from gas-fired plant and allows for a reduction of the requirement for secondary fuel at gas fired power stations during a shock scenario. Having an additional source of low carbon generating capacity would reduce the draw on secondary fuels by gas fired generating plants and enable the existing secondary fuel supplies to last for a longer time period.

Increased secondary fuel storage at gas fired power stations

The CRU published its decision on Secondary Fuel Obligations on Licensed Generation Capacity in January 2009[66]. This decision requires combined cycle gas turbine (CCGT) power plants, with a capacity of more than 10 MW, to hold stocks equivalent to five days continuous running at full output. The modelling has assumed that there is an 80%

[66] CER/09/001 https://www.cru.ie/wp-content/uploads/2009/07/cer09001.pdf

availability of secondary fuel at gas fired power plants. Secondary fuels are an important tool to mitigate against the impact of supply shocks on electricity customers. If there is a gas supply shock, then secondary fuels can be employed to continue generating electricity so that electricity customers are unaffected or that any effects are reduced. This mitigation option would introduce a requirement for increased reserves of secondary fuels the use of which would be limited to a shock event in which e.g., gas supplies were unavailable.

Conversion of a gas fired power plant to hydrogen

The conversion of an existing CCGT to hydrogen would provide a low-carbon source of electricity dispatch which would contribute to RES penetration targets. It would also provide diversification from gas-fired plant and allow for a reduction in the requirement for secondary fuel at gas fired power stations during a shock scenario which would allow secondary fuel supplies to be stretched over a longer time period. This mitigation option assumes the introduction of a 400 MW Hydrogen Gas Turbine (H2GT) plant by converting a CCGT to run on hydrogen fuel by 2030. It is assumed that the hydrogen is produced from non-dispatchable generation, via electrolysis, that would otherwise be curtailed throughout the year and that it is shared across the electricity and gas grids, providing a renewable source of gas.

Electricity Mitigation Package (DSR and Batteries)

This mitigation option involves using both batteries and DSR which can provide flexibility by shifting demand from one period to another to alleviate peak demand requirements. It should be noted that batteries, and a proportion of DSR, shift demand from one period to another rather than providing additional overall capacity and therefore are better suited to mitigating shorter periods of disruption. Storage technologies, such as batteries, enable greater penetration of RES generation by storing RES output that would otherwise be curtailed and making this available in high-demand periods. Storage technologies can also help to smooth out load profiles by charging in low-price periods and discharging in high-price periods thus enhancing system reliability. This mitigation option assumes 335 MWh of battery energy storage in 2025 and 690 MWh of battery energy storage by 2030.

Further growth of DSR will depend both on technology uptake, such as consumers embracing smart meters and the use of flexible technologies such as EVs. Before volumes of DSR are sufficiently large and tested, there will remain some uncertainty around the reliability of DSR providers to deliver on their contracted volumes. The advantages of this mitigation option are that both batteries and DSR would bring wider benefits beyond physical security of supply such as being additional sources of flexibility which would support the

integration of RES and the operation of a high-RES system. Market structures would need to be put in place to support the delivery of batteries and DSR. Therefore, this may introduce a source of uncertainty regarding the volumes that can be deployed by 2030. However, as batteries and DSR are both modular they can be introduced gradually and are more flexible in terms of their deployment than larger pieces of infrastructure.

Table 7. Shortlisted gas and electricity security of supply mitigation options considered in the context of three key criteria produced by CEPA as part of their technical analysis.

Mitigation Options	Security of Supply Impact	Feasibility of Implementation	Consistency with the Climate Action Plan
Gas Storage Facility	Would need to have strategic gas storage to ensure sufficient gas availability in the case of supply shock.	Possible but challenging by 2025. Possible by 2030.	As a back-up storage facility would only be used in the event of a shock, it would have a minimal impact on future market pathways whilst guaranteeing availability of gas in the event of a security of supply shock.
Floating LNG Terminal	Leasing a floating LNG terminal would enable security of supply benefits to be delivered without committing to a long-term dependence on gas while also reducing the risk of stranded assets.	Possible but challenging by 2025. Possible by 2030.	If this were a strategic LNG project, then it would only be used in the event of a supply shock and therefore the impact on carbon emissions would be relatively low.
Gas Mitigation Package (gas storage, renewable gas, green hydrogen and gas demand side response)	Hydrogen and renewable gas in isolation, may be insufficient to mitigate against significant shock events and therefore could be included in a gas mitigation package. Demand response in the gas sector would be a suitable mitigation option for short duration shortfalls in gas supplies but would be unlikely to fully mitigate against significant supply shock events. Demand response from I&C consumers can help shift demand from periods when there are supply constraints and therefore could be included in a gas mitigation package.	The significant potential of hydrogen and renewable gas is unlikely to be realised by 2025, but production can be gradually increased by 2030. Gas DSR is possible but challenging by 2025 and possible by 2030.	Hydrogen and renewable gas are both consistent with the CAP which includes ambitions for renewable gas production by 2030. Gas DSR is consistent with the CAP in terms of reducing energy usage.

Onshore Energy Storage Project	Scalable option which addresses peak day demand growth, N-1 test, 22% curtailment and outage of UK entry point.	Possible but challenging by 2025. Possible by 2030.	Would only be used in the event of a supply shock and therefore the impact on carbon emissions would be relatively low. Potential for future hydrogen use.
Natural Gas Demand Management	Would reduce further exposure to security of supply risks.	Feasible by 2025, provided alternative in place.	Consistent with climate ambition.
Additional electricity interconnection	Additional electricity interconnection could deliver security of supply mitigation while bringing wider benefits to RES integration and social welfare.	Unlikely by 2025. Possible by 2030.	The CAP commits to exploring the potential for further interconnectors which can provide a source of flexibility for supporting RES penetration.
Additional electricity storage – pumped hydro	If a suitable site can be identified, pumped hydro could provide a low carbon form of energy storage. While not perfectly suited to long duration shock events, the flexibility provided could help to mitigate relatively small but sustained electricity supply shocks by profiling demand to periods of high-RES output.	Unlikely by 2025. Possible by 2030.	Consistent with the CAP in terms of providing a low carbon form of energy storage.
Additional generation capacity – dispatchable low carbon	While the capacity of deployment may be low by 2030, the provision of additional dispatchable capacity and diversification away from gas-fired power stations could help to mitigate the magnitude of risks.	Unlikely that these technologies can be individually deployed on a large scale by 2030 due to factors such as limited resource availability.	The CAP commits to doubling indigenous biomass supply for the generation of heat and electricity (Action 320).
Increased secondary fuel storage at gas fired power stations	This mitigation option can provide relatively high additional capacity which is readily deployable in comparison to other options, and it is one of the only options that could be deployed at scale for 2025.	Likely to be able to introduce by 2025.	While secondary fuels would have a high carbon intensity, they would be reserved for use in a shock event only and therefore, any increase in carbon emissions would be low outside of a shock.
Conversion of a gas fired power plant to hydrogen	This mitigation option is suitable for long duration shortfall in electricity supplies. A recent Baringa study	Unlikely by 2025.	The CAP refers to the use of hydrogen for electricity generation, including as a measure

	assumes 1,290 MW of electrolyser capacity along with 3TWh of H2 storage capacity and 900 MW of retrofitted H2 generation capacity in Ireland in 2030.	Possible, but uncertain, by 2030.	to potentially achieve emissions towards the lower end of the target range by 2030.
Electricity Mitigation Package (DSR and Batteries)	While DSR may not be able to deliver mitigation of a long-sustained shock in isolation, the additional flexibility provided may help to mitigate relatively small but sustained electricity supply shocks by profiling demand to periods of high-RES output. Additional DSR could also provide wider benefits including additional flexibility to support RES penetration. Although batteries may not be able to deliver mitigation of a long-sustained shock in isolation, the additional flexibility provided may help to mitigate relatively small but sustained electricity supply shocks by profiling demand to periods of high-RES output.	Volumes of DSR have already entered into the CRM and can be scaled up to some degree by 2025. Battery deployment could be scaled up to some degree by 2025.	The CAP commits to enabling and incentivising demand side flexibility (Action 101). The CAP commits to a policy statement which is supportive of a sustainable supply of minerals required to develop batteries.

Section 7 of the CEPA analysis on the impact of different mitigation measures sets out a quantitative and qualitative assessment of the impacts of each of these mitigation options.

8. Tools and Measures

Section 7 of this consultation primarily focused on infrastructure related mitigation measures but there are other measures that could be employed to address Ireland's security of supply issues.

8.1 Joint Planning

Currently Ireland's electricity and gas projected supply and demand assessments are produced separately by EirGrid and Gas Networks Ireland respectively. The interdependencies between the electricity and gas networks has increased in recent years and this trend is expected to continue as more intermittent renewable sources are added to Ireland's energy system. The development of a renewable gas market is also likely to impact the planning of the electricity and gas networks at distribution and transmission levels. It is

therefore proposed that an annual assessment for electricity and gas should be produced collaboratively and jointly by the operators of the electricity and gas transmission and distribution networks i.e., EirGrid, ESB Networks and Gas Networks Ireland. This joint electricity and gas assessment can consider renewable gases such as biomethane and hydrogen and could lead to greater collaboration and the development of synergies between the energy systems. It can also ensure that the energy system is considered in a holistic manner and that security of supply for the Irish energy systems is considered fully. In taking such an approach, a supportive regulatory oversight of this collaborative joint electricity and gas assessment would be required.

8.2 Regular Energy Security Reviews

It is important that Ireland has up-to-date and regular information on security of supply available, even during periods when our energy security is considered high.

In order to deliver this, it is proposed that a technical analysis on energy security would be produced every two years, which would:

(i) Compile and report on energy security statistics
(ii) Assess Ireland's energy security against key indicators
(iii) Report on implementation of policies and measures arising from the Department's formal reviews
(iv) Report on international developments on energy security
(v) Set out relevant technology developments.

Having this information available will help ensure the Department can monitor and update energy security policy as appropriate.

It is also proposed that the Department would carry out an energy security review at least every four years whereby the Department reviews all relevant energy security legislation, policies and measures.

8.3 International Arrangements

Ireland has two intergovernmental agreements (IGAs) with the UK that were put in place in 1993 and 2004 regarding the two sub-sea gas interconnectors between Ireland and GB. These Agreements contain high level articles related to cooperation in the event of disruption to supply. The EU has competence in energy security of supply as part of their remit over energy policy as set out in Article 194 of the Treaty on the Functioning of the European Union (TFEU). While the UK was a member of the EU, all security of supply arrangements were covered by EU regulations on security of supply which have changed and developed

over time. The most recent regulation on security of supply is Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply. When the UK left the EU, a Trade and Cooperation Agreement was put in place and this agreement allows for the establishment of frameworks for cooperation with the UK related to security of supply. Based on on-going dialogue with the EU and the UK on security of supply, these discussions could result in amendments to current arrangement for gas that build on the existing arrangements in the event of a supply shock.

9. Consultation Questions

The Department of Environment, Climate and Communications would welcome your feedback on the Electricity and Gas Security of Supply Review. Respondents are requested to consider the questions asked in this consultation when submitting a response, but it is not necessary to provide responses to all questions. Please supplement your response with any relevant supporting information, evidence and/or analysis.

Risks

1. Are there any other security of supply risks that you can identify in addition to those set out in section 6?
2. If there are other risks that you have identified, could you outline some mitigation options to address the risk(s)?
3. Are the five shock scenarios that were considered, and the additional scenarios related to the Russian invasion of Ukraine, sufficiently broad?

Mitigation Options

4. Do you have any additional mitigation options that you think should be considered?
5. Which gas supply mitigation options, if any, should be considered for implementation?
6. Which electricity supply mitigation options, if any, should be considered for implementation?
7. What measures should be considered on the demand side to support security of supply of electricity and gas?
8. Do you have any views on how the mitigation options should be implemented?

Policy Measures

9. Do you support the policy measures proposed in section 8 of the consultation paper?
10. What further tools and measures do you think would contribute the most to Ireland's energy security of supply?

10. Appendix

Glossary

Abbreviation or Term	Definition or Meaning
BER	Building Energy Rating
CAP	Climate Action Plan
CCGT	Combined Cycle Gas Turbine
CEPA	Cambridge Economic Policy Associates Ltd.
CRM	Capacity Remuneration Mechanism
CRU	Commission for Regulation of Utilities
DSR	Demand Side Response
EC	European Commission
EU	European Union
EV	Electric Vehicle
FDI	Foreign Direct Investment
FSRU	Floating Storage and Regasification Unit – this is a multi-function vessel which combines LNG storage and built-in regasification systems onboard a ship.
GB	Great Britain
GCS	Generation Capacity Statement
GHG	Greenhouse Gas
GNI	Gas Networks Ireland
IEA	International Energy Agency
IGA	Intergovernmental Agreement
LEU	Large Energy User
LNG	Liquified Natural Gas – this is natural gas that has been cooled to –162° C changing it from a gas into a liquid that is 1/600th of its original volume thus enabling it to be shipped safely and efficiently aboard specially designed LNG vessels.

NDP	Network Development Plan
NEC	Network Emergency Coordinator
NGEM	National Gas Emergency Manager
NGEP	National Gas Emergency Plan
NGSE	Natural Gas Supply Emergency
PfG	Programme for Government
SEAI	Sustainable Energy Authority of Ireland
SEM	Single Electricity Market
SEMO	Single Electricity Market Operator
SONI	System Operator for Northern Ireland
TWh	Terawatt-hour
UK	United Kingdom
UR	Utility Regulator – this is an independent non-ministerial government department responsible for regulating Northern Ireland's electricity, gas, water and sewerage industries.