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Gas
Networks
Ireland

Hydrogen and Ireland's
national gas network

Introduction

Gas Networks Ireland owns and operates the natural gas transmission and distribution network in Ireland and is responsible for the safe transportation of gas to over 706,000 customers 24 hours a day, 365 days a year. Gas Networks Ireland believes that the development of a domestic hydrogen industry will involve a broad range of stakeholders, including policy makers, regulators, standards authorities, hydrogen producers, shippers, storage and transportation operators and the hydrogen end customers. As Ireland's gas network operator, Gas Networks Ireland's role will be in the transportation and storage of hydrogen.

Gas Networks Ireland believes hydrogen will play a critical role in decarbonising the gas network and is supportive of projects, which aim to deliver hydrogen to energy customers, for end-uses such as space heating, transport, industry and dispatchable electricity generation, in a safe and secure manner. While there are different possible hydrogen supply chains, Gas Networks Ireland believes that the re-use and re-purposing of existing gas network infrastructure is a cost-effective gas transportation model. However, currently the Code of Operations by which the gas network is operated in Ireland does not allow for the injection of hydrogen into the gas network.

The purpose of this guidance document is to provide a high-level overview to interested parties of current gas regulation and policy, and to outline the main areas that will need to be addressed and actions required in order to facilitate the injection, transportation and storage of hydrogen on the gas network in Ireland.

Hydrogen policy

The European Commission's communication, 'A hydrogen strategy for a climate-neutral Europe', published in July 2020, sets out the ambition for hydrogen in Europe. The EU wants to create a sustainable hydrogen value chain, boost the demand for clean hydrogen, develop a supporting framework including well-functioning markets with clear rules, promote research and innovation and develop opportunities with other countries and regions to establish a global hydrogen market. The strategy recognises that hydrogen is required to achieve full decarbonisation of the energy sector.

The Irish Government in its 2021 Climate Action Plan states: "Scenarios for net zero emissions by 2050 include a potentially significant role for the use of zero emissions gases (in particular biomethane and green hydrogen) and, in planning for the longer-term, we must ensure that they can meet their full potential. It is critical however that the use of zero-emissions gases is directed towards sectors that maximise emissions abatement, in hard to abate sectors. That involves deciding on clear targets and supporting measures – with 2030 as a key milestone – but with the clear understanding that the groundwork for deployment needs to begin now."

Hard to abate sectors that zero emissions gases can decarbonise include heavy commercial transport, high temperature process heating and heavy industry.

It is anticipated that policy makers will continue to set targets and develop supporting measures which will encourage the development and growth of a hydrogen economy in Ireland. A policy and regulatory roadmap for green hydrogen injection into the gas network is to be developed by the Department of the Environment, Climate and Communications (DECC) part of the Climate Action Plan 2021 and is to be delivered by Q1 2023.



Market arrangements for hydrogen

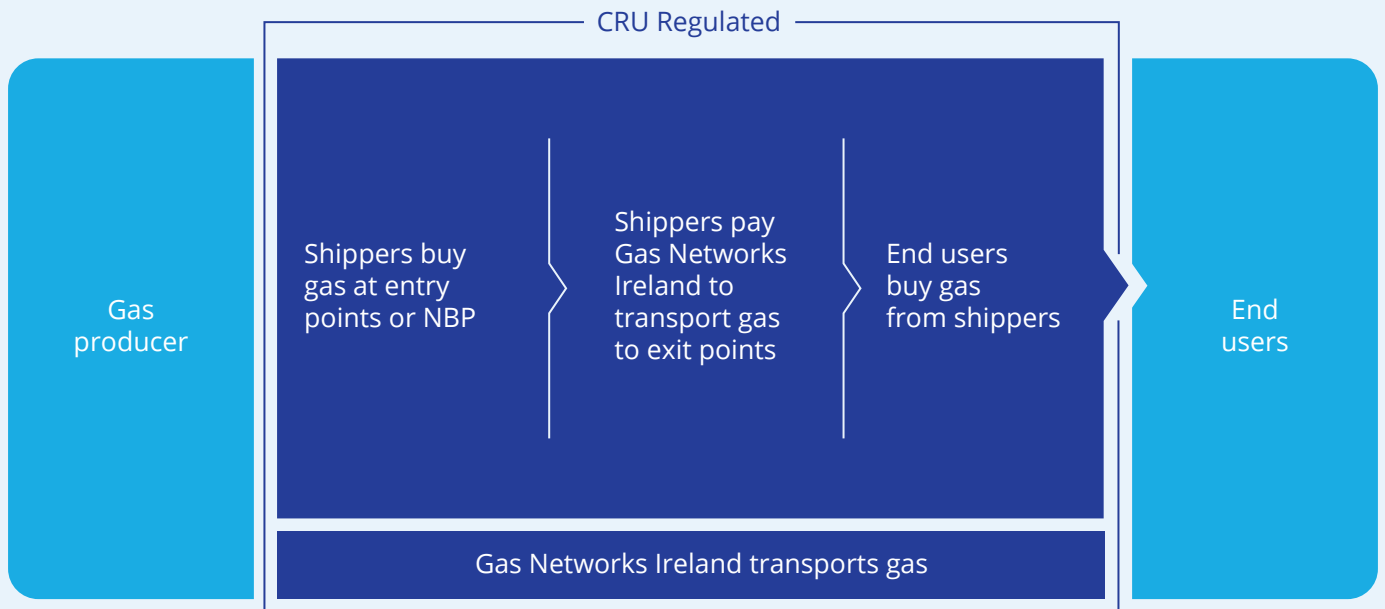


Figure 1 – Gas market participant

Code of Operations

The Commission for Regulation of Utilities (CRU) has set out the Code of Operations to govern the relationship between Gas Networks Ireland as the gas transporter and the shippers on the gas network. The Code of Operations outlines regulatory compliance, capacity arrangements, nominations and allocation arrangements, balancing, shrinkage, gas specification and quality and other market arrangements. The gas quality entry specification, as it currently exists, is specific to natural gas and biomethane. It therefore does not currently permit the blending of hydrogen within the network.

Clauses related to hydrogen blending will need to be added to the Code of Operations to govern how hydrogen is entered onto the gas network and transported to end-users. Physical limitation such as the percentage of gas flows permitted, pipeline capacity and storage arrangements will have a bearing on the new code rules. While there is an established process for updating the Code of Operations via an industry body known as the Code Modification Forum all changes to the Code of Operations must ultimately be approved by the CRU.

Gas shippers

Figure 1 illustrates a high-level overview of current gas market participants. Shippers are licensed by the CRU to ship gas from entry points to consumers and are required to hold a safety case

which has been accepted by the CRU. For a shipper to enter hydrogen onto the network they may need to update their safety case if considered necessary under the Gas Safety Framework. Depending on the complexity of initial market arrangements for blended hydrogen, the shippers' customers billing system may need to be adjusted to reflect the lower calorific value of the gas consumed.

Hydrogen connections policy and entry tariffs

The connections policy, approved by CRU, governs the rules and financial analysis used by Gas Networks Ireland to calculate and offer a network connection to a prospective customer. To facilitate the connection of a hydrogen gas facility to the gas network, a hydrogen connections policy including entry tariffs will need to be developed for approval by the CRU.

Renewable Gas Certification

Gas Networks Ireland currently register and issue certificates to Irish producers that inject renewable gas into the gas network. Ireland's Renewable Gas Registry currently only issues certificates for biomethane and will need to be updated to accommodate hydrogen related certificates. By providing an objective means of tracking the commercial transactions of hydrogen through the supply chain, Ireland's Renewable Gas Registry will help establish trust in the market and confidence in the renewable gas sector.

Technical arrangements for hydrogen

Technical standards development

European and Irish gas infrastructure technical standards will need to be updated to provide for blends of natural gas and hydrogen and for 100% hydrogen. National Standards Authority of Ireland (NSAI) and the European Committee for Standardisation (CEN) are actively engaged in a standardisation programme related to necessary safety and technical standards required for hydrogen. Standards related gas infrastructure participation in the hydrogen standards development activities, by Irish gas industry experts and academia, is via the Gas Technical Standards Committee (GTSC) of the NSAI.

Injection and location analysis

To understand the impact of hydrogen on the gas network, Gas Networks Ireland has commenced a programme of work to consider the factors outlined below, to identify optimal injection locations and any associated reinforcement requirements.

Hydrogen injection should ideally be located close to gas pipelines and occur in areas of high gas volume flows. Gas network characteristics such as energy density, pressure drop, flow rates, and compressibility factors - modelled across the gas network - will determine optimum injection locations and volumes. Pressure drops and velocities will increase in some pipelines, due to the increased volumetric gas flowrate, potentially requiring new pipelines to mitigate network constraints. Similarly, gas pressure reducing installations may require upgrading to address any local network constraints.

The introduction of hydrogen at scale may require additional compression to move the gas across the gas network. The location of hydrogen storage facilities will also be a consideration for injection locations. Short-term storage may be used to ensure consistent supplies of hydrogen for injection. Large-scale hydrogen storage could provide interseason stores for renewable energy, helping to balance energy supply and demand.

Technical readiness of the network to transport hydrogen

Gas Networks Ireland operates one of the most modern gas networks in Europe and is currently investigating the impacts of introducing hydrogen onto the gas network with particular focus on the technical and safety aspects of transporting the gas, either as a blend of up to 20% hydrogen by volume, or as a near 100% hydrogen. There is increasing confidence in the ability of the polyethylene distribution networks to carry hydrogen blends. However, certain network components, devices and systems (e.g. equipment used for energy measurement), not currently compatible with the injection of higher levels of hydrogen into the gas network, will need to be modified or replaced.

Further research and development projects will be necessary to understand how to prepare the gas infrastructure for the introduction of higher hydrogen blends, without compromising the existing high safety standards of the gas network, and how to adapt the gas network to enable it to transport 100% hydrogen.

Gas Networks Ireland has established a research and development facility in Citywest, Co. Dublin, to ensure the safe transportation and storage of hydrogen on the gas network in the future. Gas Networks Ireland is open to discussions with third parties on developing pilot projects to assist in this research and development. Asset management requirements for hydrogen blending and injection facilities, and other gas network assets, will need to be developed for hydrogen, to ensure hydrogen related assets on the gas network meet the necessary safety and operational requirements over their life cycle.

Safety case for hydrogen transport

The Gas Safety Framework (GSF) in Ireland is overseen by the CRU. Among the energy related safety responsibilities of the CRU is to regulate the activities of gas undertakings with respect to safety. All natural gas undertakings are required to be licensed by the CRU, and under the conditions of the licence a safety case must be submitted to the CRU for review and acceptance. The Gas Networks Ireland safety case is currently accepted based on transporting natural gas (or biomethane) on the gas network.

The introduction of hydrogen onto the network can only take place following a process of safety case development which addresses the required technical and operational changes necessary, to ensure the integrity of the gas network with hydrogen and the safety of its end users. The process will include the completion of an As Low As Reasonably Practicable (ALARP) Risk Assessment. Gas Networks Ireland will also develop the appropriate competencies of contractors and employees to support the safety case. Gas Networks Ireland has commenced the work of developing a safety case for hydrogen which will ultimately require review and acceptance by the CRU.

Hydrogen stakeholders

The development of a hydrogen industry will involve a broad range of stakeholders including; policy makers, regulators, standards authorities, hydrogen producers, shippers, storage and transportation operators and the hydrogen end users.

Stakeholder	Input and actions
Policy makers	Set out the climate action goals and roadmap. Develop hydrogen targets and supporting measures.
CRU	Review and accept hydrogen safety cases for the network operator and shippers. Consider changes that will be proposed to the Code of Operations for approval. Approve a hydrogen connection policy and tariffs for hydrogen injection.
Gas Networks Ireland	Investigate the technical readiness of the gas network assets for hydrogen injection and blending. Carry out analysis of the network to determine optimum locations for injection. Develop a safety case for the introduction of hydrogen onto the network.
Shippers	Update their safety case if necessary. Participate in Code Modification Forum to consider changes to the Code of Operations. Engage with market systems arrangements.
NSAI, CEN	Update, with the support of industry experts, the gas infrastructure technical standards to provide for hydrogen blends and for 100% hydrogen.
Producers	Support the development of national policy and necessary regulatory / market changes in relation to hydrogen. Meet all planning, environmental or market obligations.
End users	Support the development of national policy and necessary regulatory / market changes in relation to hydrogen.

Table 1 – Summary of stakeholder Inputs

Summary and conclusion

Hydrogen has been identified as a key enabler of Ireland's and Europe's decarbonisation ambitions with significant targets being set by the EU in relation to hydrogen production. The re-use and re-purposing of existing gas network infrastructure is a cost-effective transportation model for this gas. The injection and transportation of hydrogen on the gas network cannot be achieved until the relevant policy, technical/safety assessment and regulatory/market framework have been developed and established. These are required to ensure that the gas network can be operated safely and reliably for all its customers. These activities will require collaboration across energy producers, transporters and regulators.

A policy and regulatory roadmap for green hydrogen injection into the gas network is to be developed as part of the Climate Action Plan 2021 and is to be delivered by Q1 2023. Work has already begun on a number of these activities with Gas Networks Ireland already engaged in assessing our network's readiness for hydrogen, identification of optimal injection locations and developing a safety case for hydrogen transportation.

Contact

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Annex

Additional information

- For additional information on transportation and storage of hydrogen see the ENTSOE, GIE and Hydrogen Europe report [“How To Transport And Store Hydrogen – Facts And Figures”](#)
- For additional information of the development of hydrogen pipeline infrastructure see the [“European Hydrogen Backbone”](#) Report.
- For additional information on an existing demonstration project in the UK visit the at [Keele University website](#).

Climate Action Plan actions

Action 169 – Develop renewable gas in the gas grid

Steps necessary for delivery	Proposed output	Timeline	Lead	Key stakeholders
Establish an official certification scheme for renewable gas in the gas grid.	Secondary legislation establishing GNI's renewable gas registration scheme.	Q2 2022	DECC	CRU, GNI
Test the technical feasibility of safely injecting green hydrogen blends in the gas grid.	Completed assessment of the impacts on network operation, integrity, and end users' appliances.	Q4 2022	GNI	CRU, DECC
Assess the potential for energy system integration between the electricity and gas networks including the production, storage and use of green hydrogen.	Assessment of the potential for electricity and gas system integration published.	Q1 2023	DECC	CRU, GNI, EirGrid, SEAI
Develop a policy/regulatory roadmap for green hydrogen use in the natural gas grid.	Publish a policy/regulatory roadmap for green hydrogen use in the natural gas grid.	Q1 2023	DECC	CRU, GNI

Action 172 – Consider introducing a renewable energy obligation in the heat sector

Steps necessary for delivery	Proposed output	Timeline	Lead	Key stakeholders
Complete the public consultation on the potential introduction of a renewable energy obligation in the heat sector.	Public consultation on the potential introduction of a renewable energy obligation in the heat sector published.	Q4 2021	DECC	DETE, CRU, SEAI
Determine if renewable energy obligation should be introduced in the heat sector.	Publish a decision on whether an obligation should be introduced along with the planned timeframe and scope.	Q1 2022	DECC	DETE, CRU, SEAI

Annex

Climate Action Plan actions continued

Action 268 – Transition Dublin Metropolitan PSO bus services to low/zero emission bus fleet

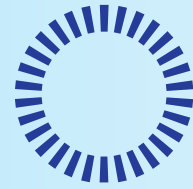
Steps necessary for delivery	Proposed output	Timeline	Lead	Key stakeholders
Complete pilot of hydrogen fuel cell double deck buses and review performance.	Complete and publish a review of pilot findings.	Q4 2022	NTA	DOT, Bus Éireann

Action 287 – Support the development of renewable gas, such as biomethane, as a transport fuel in the transport sector

Steps necessary for delivery	Proposed output	Timeline	Lead	Key stakeholders
Engage with relevant stakeholders with regards to the renewable gas registry to support certification requirements for grid-injected renewable gases in the transport sector.	Registry established.	Q4 2022	CRU	DOT, DECC, GNI

Action 294 – Carry out a review of the supply of renewable transport fuels in Ireland, such as biofuels, advanced biofuels, e-fuels, synthetic fuels, green hydrogen, and biogas

Steps necessary for delivery	Proposed output	Timeline	Lead	Key stakeholders
Progress a study reviewing the profile, sustainability, and supply of renewable transport fuels in Ireland, such as biofuels, advanced biofuels, e-fuels, synthetic fuels, biogas, and green hydrogen.	Research report including recommendations for sustainable biofuels policy development published.	Q2 2022	DOT	NORA, SEAI, DECC, DAFM, Teagasc, Industry



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