



Green Hydrogen in Ireland: *Moving to the Next Stage*

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At a Glance

- Ireland has a large potential for renewable energy generation via offshore wind but developments have been delayed and it is not expected to achieve 2030 targets.
- This delay is also impacting the potential for the development of an indigenous green hydrogen industry and increasing the likelihood of needing to import hydrogen to achieve Ireland's decarbonisation goals.
- Ireland needs to take immediate policy action, adjusting regulations, creating certification schemes, and designing markets and financing schemes for hydrogen production and use to facilitate the pathway to a net-zero future energy system.
- This paper highlights the policies required to ensure Ireland is ready to be part of the hydrogen economy.

Executive Summary

In a country which has abundant renewable energy resources yet is still heavily reliant on fossil fuels, the role of green hydrogen has become clear. Hydrogen can be used to provide renewable energy storage, flexible power generation, industrial heat, transport fuel, and energy export opportunities. Indeed, Ireland's existing policies acknowledge that decarbonised gases like renewable hydrogen have a key role to play in the transition to a net-zero energy system. However, the current National Hydrogen Strategy, published in 2023, lacks a detailed route towards the establishment of a hydrogen sector in Ireland, which leads to market uncertainty and opportunity costs. While hydrogen is seen as a longer term solution for energy decarbonisation, essential regulatory frameworks must be established immediately to allow first movers the opportunity to begin production, storage, transportation and using hydrogen in the energy sector. Furthermore, if Ireland is committed to decarbonisation, then investment into hydrogen is required now to support the developing market and ensure long term goals can be achieved. Naturally, this comes at a cost and requires a willingness to support ini-

tial development efforts by the Government, its relevant Departments, and regulators (Department of Climate, Energy, and the Environment, Department of Finance and the Commission for Regulation of Utilities). Nevertheless, establishing a strong regulatory and policy framework is an important asset to industry and investors, whose participation is needed to help realise decarbonisation efforts and ensure energy security. Aligned with the National Hydrogen Programme Implementation Plan, this paper recommends implementing policies in 4 key areas: Regulation, Certification, Market Structure and Financial Support for a redeveloped National Hydrogen Strategy. To support these recommendations, this paper provides quantitative evidence and examples of hydrogen policies already enabled in other countries, thereby serving as a starting point for the newly appointed National Hydrogen Programme Taskforce.

Glossary of Terms

Anaerobic Digestion (AD): A biological process by which microorganisms break down organic materials (such as agricultural waste or food scraps) without oxygen, producing biogas and digestate.

Balancing and Operating Reserve System Services: Ancillary services required to maintain grid stability and reliability, such as frequency regulation and reserve power to balance unexpected changes in supply or demand.

Capacity Factor: The ratio of the actual energy produced by a power plant over a period to the maximum possible energy it could have produced at continuous full power during that period.

Contract-for-Difference (CfD): A financial mechanism used to support renewable energy investment. It guarantees a stable revenue stream for generators by paying the difference between the strike price and the reference market price.

Curtailed Renewables: Renewable energy that could have been generated but is deliberately reduced or not utilised, typically due to grid constraints or oversupply.

Flexible Power Generation: Electricity generation that grid operators can quickly control, adjust, or turn on/off to meet instantaneous customer demand and ensure grid stability.

Guarantees of Origin (GoO): An electronic certificate that proves a certain volume of energy, typically one megawatt-hour (MWh), was produced at a specific plant, indicating its renewable or non-renewable origin.

Hydrocarbon Reforming: Processes in which hydrocarbons are converted into hydrogen, carbon monoxide, and sometimes other valuable products using heat, pressure, and catalysts. For producing hydrogen, steam methane reforming (SMR) is the main commercial process.

1 Introduction

Climate change has been referred to as the biggest threat that humans have ever faced, with consequences such as extreme weather events, food and water insecurity, and ecosystem degradation (IPCC, 2023). A major contributor to climate change is the production and consumption of energy, which is estimated to contribute to 75% of all greenhouse gas (GHG) emissions globally (IEA, 2024). To address this, many countries, including Ireland, are working to increase the share of renewable energy sources (RES) in electricity generation, and the share of electricity used in heating and transport (Government of Ireland, 2023a). However, most of Ireland's RES potential is wind power, which is dependent on the weather and therefore must be coupled with flexible power generation or energy storage. Furthermore, electricity is not optimal for some applications such as industry, which has high temperature heat demands, or the transport of heavy goods. For this reason, **the Irish energy system is still highly reliant on fossil fuels**, contributing to 86% of Ireland's total energy requirement (SEAI, 2024).

1.1 Why is green hydrogen needed?

Ireland has set a provisional carbon budget¹ of 151 Mt CO₂eq for 2031-2035, a significant decrease from 295 Mt CO₂eq for 2021-2025 (Government of Ireland, 2025a). By 2050, Ireland aims to be carbon-neutral. These targets require rapid emission reductions from sectors heavily reliant on fossil fuels, such as electricity generation, industry, and transport. Natural gas is currently critical to Ireland's economy, accounting for approximately 50% of the electricity generated and supplying 30% of the total energy requirement (SEAI, 2024).

¹Climate change is caused by GHG emissions, which are converted into carbon dioxide equivalents (CO₂eq) for monitoring and reporting. Thus, GHG emissions are also sometimes referred to as carbon emissions, and GHG accounting referred to as carbon accounting.

Even with anticipated decreases in natural gas consumption from the building and power sectors, gaseous fuels will continue to provide flexible backup electricity generation and medium/high-grade heat for industry in the coming years (NESC, 2025). To reduce carbon emissions, **Ireland is working to transition its gas network from natural gas to biomethane and hydrogen** (Gas Networks Ireland, 2023).

Biomethane (CH₄), a renewable gas produced from the anaerobic digestion of biological feedstocks such as agricultural residues and food waste, can be easily incorporated into the current gas network as a drop-in fuel. However, **indigenous sustainable biomethane production is limited by the availability of feedstocks and spatial resources**, with maximum production potential in the Republic of Ireland estimated at 3.7 TWh using currently available resources and 5.1 TWh with significant land use changes (SEAI, 2022).

To maximise decarbonisation of the gas sector, hydrogen will also be needed. Hydrogen (H₂) is a carbon-free gas which can be produced from hydrocarbon reforming or water electrolysis, with electrolysis utilising renewable energy sources resulting in near-zero life cycle carbon emissions (Wulf and Kaltschmitt, 2018; Patel et al., 2024). Due to the high potential for offshore wind in Ireland, potential for domestic renewable hydrogen production is high. Consequently, electrolytic hydrogen is anticipated to play a key role as a renewable gas (Gas Networks Ireland, 2023). Furthermore, there is a significant role for hydrogen as a feedstock in the production of renewable ammonia and sustainable transport fuels (Government of Ireland, 2023b).

Glossary of Terms (Continued)

Levelised Cost: The average net present cost calculated over the lifetime of a generation asset. It encompasses capital, operating, and financial costs, divided by the total expected production output.

Lifecycle Emissions: Total greenhouse gas emissions associated with a product or process, measured over its entire life cycle from raw material extraction to disposal or recycling.

Renewable Energy Directive (RED II/III): EU directives establishing targets, sustainability criteria, and regulatory frameworks for renewable energy production, use, and market integration.

Renewable Electricity Support Scheme (RESS): An auction-based policy mechanism in Ireland offering financial support through Contracts-for-Difference (CfDs) to encourage the development and deployment of renewable electricity generation projects.

Renewable Energy Sources (RES): Energy sources that are naturally replenished and virtually inexhaustible, such as wind, solar, hydro, geothermal, and tidal power.

Renewable Fuel of Non-Biological Origin (RFNBO): Liquid or gaseous fuels whose energy content originates from renewable sources (such as wind, solar, or hydropower), other than biomass.

Single Electricity Market (SEM): An integrated wholesale electricity market covering both the Republic of Ireland and Northern Ireland, enabling coordinated electricity trading, dispatch, and balancing across jurisdictions.

Strike price: The fixed price per unit of electricity established in certain energy contracts, such as a Contract-for-Difference (CfD). It determines the actual payment a generator receives for low carbon power.

Glossary of Terms (Continued)

Surplus Renewables: Excess renewable energy production that exceeds current grid demand and may be stored, curtailed, or diverted for alternative uses.

Water Electrolysis: A process that uses electrical energy to split water into hydrogen and oxygen gases.

1.2 Where is green hydrogen needed?

Ireland's National Hydrogen Strategy states **three primary strategic reasons for developing an indigenous hydrogen sector: decarbonisation, energy security, and industrial and export market opportunities**. However, it is important to point out potential trade-offs in achieving these goals.

According to the Strategy, Ireland's domestic hydrogen demand potential (including for aviation and shipping) is 19.8-74.6 TWh in 2050. The lower limit for hydrogen demand in the National Hydrogen Strategy assumes a situation with high contributions of bioenergy and abated natural gas. As a small country, bioenergy potential is limited in Ireland (SEAI, 2022), whereas indigenous natural gas supply is dwindling with no plans for increased exploration (Gas Networks Ireland, 2023). Thus, this lower limit would require high imports of biomass, biofuels, and natural gas, conflicting with the desire for energy security (Chiodi et al., 2015).

To achieve both decarbonisation goals and energy security for Ireland, substantial amounts of hydrogen will be needed for flex-

ible electricity generation, high-grade industrial heat and zero-carbon transport fuel.

Based on an electrolysis system efficiency of 50-70% (IRENA, 2020), 107-149 TWh of renewable electricity will be needed to satisfy the upper limit of hydrogen demand in 2050. In theory, Ireland aims to have a total installed capacity of 37 GW of offshore wind by 2050 (Government of Ireland, 2024). Based on a capacity factor of 50% (Wind Energy Ireland, 2023), the electricity produced from offshore wind would be enough to cover all of Ireland's domestic hydrogen demand as well as some hydrogen for export (Figure 1A). However, experts have expressed scepticism in the offshore wind targets, with a total of 10-20 GW by 2050 being more likely (SEAI, 2025). Furthermore, electricity demand in Ireland is expected to grow substantially to 73-110 TWh by 2050 (EirGrid & SONI, 2024; Wind Energy Ireland, 2023), compared to 30-33 TWh today (SEAI, 2024). It is therefore likely that much of the electricity from future offshore wind will be supplied to the grid to meet decarbonisation targets, which can already be foreseen given that all 3 GW of offshore wind parks currently under development will be feeding into the grid via the Renewable Electricity Support Scheme (EirGrid, 2023). As shown in Figure 1B, even if 10 GW of Ireland's offshore wind was dedicated to hydrogen production, this would result in only 22-31 TWh of hydrogen availability. Thus, **if renewable energy and/or hydrogen production projects are not ramped up, it is likely hydrogen imports will be required to cover domestic needs**, conflicting with energy security and the desire to be a net hydrogen exporter.

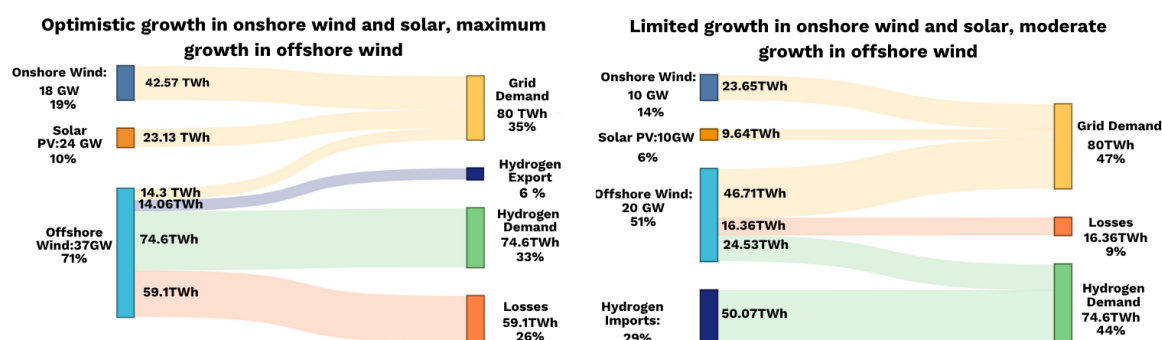


Figure 1: Capacity, generation, and use of renewable electricity in Ireland in 2050. A) High level of renewable installations based on optimistic growth in onshore wind and solar (SEAI, 2025) and maximum growth in offshore wind (Government of Ireland, 2024), B) low level of renewable installations based on pessimistic growth in onshore wind and solar and moderate growth in offshore wind (SEAI, 2025).

1.3 Why should we start now?

From now to 2030, electricity sector emission reductions are anticipated through wind and solar electricity reaching 60% of generation, enhanced interconnectors (Celtic and North-South), new gas-fired power plants, battery storage and demand-side units (EPA, 2025), with no significant contribution from hydrogen expected. In the long-term, renewable hydrogen will be needed for producing high- and medium-grade industrial heat and transport fuel. However, the development of the hydrogen sector will take time. **If Ireland does not want to become reliant on hydrogen imports in the future, infrastructure for hydrogen production must be initiated now.**

Indeed, the target for Irish green hydrogen is to commence production from renewable electricity, curtailed or otherwise, prior to 2030 (Government of Ireland, 2025a). However, significant challenges face green hydrogen. While the Climate Action plan sets out a target of at least 5 GW of offshore wind and an additional 2 GW of offshore wind for hydrogen production by 2030 (Government of Ireland, 2023a), it is likely this target will be missed given that existing offshore wind projects are facing planning delays and a critical lack of port infrastructure (Duggan & Carton, 2024). Furthermore, there is currently no market demand for green hydrogen in Ireland, despite several potential users investigating its use.

To enable the development of the green hydrogen market, a regulatory and policy framework must be established well in advance of 2030. This urgency is reflected in the recently released National Hydrogen Programme Development Plan (Government of Ireland, 2025b), which aims to establish a National Hydrogen Programme Taskforce (NHP Taskforce) to:

1. develop the necessary legislation, regulatory, and safety frameworks to enable early hydrogen projects,
2. enhance knowledge, explore opportunities and provide further clarity on the role of hydrogen in a net zero energy system,
3. put in place the necessary policies and frameworks to fund hydrogen innovation and routes to market, and
4. ensure a coordinated cross-departmental approach to the development of the hydrogen sector.

These objectives require strong evidence based on scientific research, industrial experiences, as well as learning from best policy practices across the world. This paper describes the current status of science and policy in 4 key areas: Regulation, Certification, Markets and Financing. It then recommends potential policy options to support the goals of a redeveloped National Hydrogen Strategy.

2 Regulating Hydrogen: From Blending to Dedicated Pipelines

Gas Infrastructure Europe has already published plans for a European Hydrogen Backbone (Gas Infrastructure Europe, 2024), in which 33 energy infrastructure operators, including Gas Networks Ireland, aim to develop a pan-European infrastructure plan for hydrogen transport. In Ireland, two parallel strands are planned. Pilot projects to blend hydrogen are expected to begin by 2026, while regional hydrogen clusters such as the Shamrock Hydrogen Valley in the Shannon Estuary and the proposed Cork Hydrogen Valley are planned before 2030. These hubs will rely on dedicated 100% hydrogen infrastructure, including pipelines, electrolyzers, and early storage pilots (Government of Ireland, 2023b).

Hydrogen blending into the Irish gas network is effectively limited to trace levels. The Commission for Regulation of Utilities (CRU) applies gas-safety rules aligned with the United Kingdom, where the current limit in the natural gas system is 0.1% hydrogen by volume under the Gas Safety Management Regulations (GSMR). Because the United Kingdom supplies the majority of Ireland's natural gas through subsea interconnectors, alignment on gas quality constrains Ireland's blending level (SEAI, 2024; Department of Climate, Energy and the Environment, 2025). Although the EU's hydrogen blending provisions require up to 2% hydrogen at interconnection points between member states by 2026 (European Hydrogen Observatory, 2025), those rules do not apply to UK-Ireland gas flows. As a result, the 0.1% national limit will remain in force until Irish regulations and UK GSMR rules are revised. In the UK, the Department for Energy Security and Net Zero and Ofgem, Britain's gas and electricity regulator, are consulting on proposals to permit hydrogen blending into the GB gas transmission network, which would require amending the GSMR threshold (2025).

In parallel with blending trials, Ireland is also considering the development of dedicated 100% hydrogen pipelines within regional clusters. These pipelines, separate from the ex-

isting natural gas grid, would connect production sites, storage facilities, and large industrial consumers. Current Government strategy foresees cluster-based infrastructure emerging before 2030, with expansion and eventual interconnection into a national hydrogen network during the 2030s (Government of Ireland, 2023b). Where feasible, existing natural gas assets may be repurposed, although new construction will also be required (SEAI, 2024). These timelines may be optimistic, given the absence of a domestic regulatory framework for hydrogen transport and the need to harmonise with emerging EU network codes for pure hydrogen systems.

Work is underway to build the standards and technical evidence needed for change. The National Standards Authority of Ireland (NSAI) is developing hydrogen-related standards aligned with EU and international guidance. Furthermore, Gas Networks Ireland (GNI) is conducting trials at its Network Innovation Centre in Dublin, where research has shown that domestic appliances can operate safely with blends of up to 20% hydrogen without modification (Ekhtiari et al., 2023). Further studies on network materials and safety systems are ongoing. **The evidence provided by these studies should be used to immediately inform revisions to blending limits, gas quality standards, and safety codes.**

3 Green Hydrogen Certification: From Compliance to Global Market Access

Along with permission to transport hydrogen, a hydrogen certification scheme would give the assurance to consumers that the hydrogen they are using is coming from a clean source. In Ireland, renewable electricity is certified through a Guarantees of Origin (GoO) system under the EU framework. However, hydrogen certification lacks a defined framework and implementation timeline. This absence leaves potential early-stage hydrogen producers without a reliable mechanism to demonstrate compliance with the Renewable Fuel of Non-Biological Origin (RFNBO) standards mandated by the EU. In countries such as Germany, hydrogen certification is regu-

lated under the Renewable Energy Directive (RED II/III), which sets a lifecycle emissions threshold of 3.4 kg CO₂eq per kg of hydrogen. With the impending deadline for transposing the revised Renewable Energy Directive (RED III), Ireland must integrate Articles 19 and 22a, which address GoOs and RFNBO targets, into national law to avoid potential infringement proceedings (European Commission, 2023). Furthermore, the EU Delegated Regulation (EU) 2023/1184 outlines detailed carbon accounting requirements, including additionality criteria and temporal and geographic correlation measures, which define the operational parameters for compliant hydrogen certification across member states (Directorate-General for Taxation and Customs Union, 2023).

In Ireland, the key barrier is governance rather than technical feasibility. No authority has been mandated to establish a hydrogen GoO framework, with policy efforts focused instead on offshore wind, biomethane, and grid integration. While the absence of large-scale hydrogen production reduces immediate compliance pressure, this delay risks regulatory lag once projects or imports begin. To overcome these certification challenges, a two-tier certification framework would be helpful. The first tier would issue digital GoOs for every kilogram of hydrogen produced, stored, injected, or exported, fully aligned with RED III and Delegated Regulation 2023/1184. The second tier would accredit established third-party sustainability schemes such as ISCC and CertifHy to integrate lifecycle GHG emissions data with the GoOs (ISCC, 2022; CertifHy Consortium, 2021). Care must be taken when implementing this certification to ensure compatibility with future trading partners. Unlike the more directive approach of the EU framework, the U.S. system does not define specific requirements for the source of electricity inputs but instead assesses emissions outcomes, with a maximum threshold of 4.0 kg CO₂eq per kg of hydrogen (Internal Revenue Service, 2025), while the UK requires a CO₂ emissions threshold of less than 2.4 kg per kg of H₂ (Department for Energy Security & Net Zero, 2023).

Expanding Gas Networks Ireland's existing Renewable Gas Registry, which currently issues biomethane GoOs, to include hydrogen certification presents a cost-effective alternative to developing a new system, thereby facilitating regulatory compliance and accelerating market readiness. To enable cross-border hydrogen trade and avoid regulatory misalignment, **it is essential that the expanded registry ensures interoperability and mutual recognition with key trading partners, particularly the United Kingdom.**

4 Market Reform and Financing: Getting hydrogen off the ground

The National Hydrogen Strategy acknowledges the importance of costs (mentioning the words “cost” or “costing” 85 times); however, it does not provide the actual cost of hydrogen production and use within the Irish context, despite strong published work exploring this topic (Gunawan et al. 2019; 2020; McDonagh et al. 2018; 2019; 2020; Moran et al. 2023; 2024). Economics are regionally-dependent and should be explored in detail to inform appropriate policies.

By providing a fixed electricity price for produced power for a 15-20 year period, the Renewable Electricity Support Scheme (RESS) has been influential in the expansion of renewable energy installations in Ireland by derisking renewable energy projects for private investors. However, the Government's promise to pay for curtailed power has enabled the current situation where in a few years potentially 11-29% of all renewable energy generated will be curtailed (Vance et al., 2025), with no incentive for other uses. The Climate Action Plan aims for production of green hydrogen from surplus renewable electricity by 2030, with the National Hydrogen Strategy also reflecting this. Research has found that if implemented on a national scale, hydrogen produced from this power could have a minimum levelised cost of hydrogen (LCOH) of 1.20-9.31 €/kg (36-276 €/MWh), with a LCOH of 1.26-2.44 €/kg (38-73 €/MWh) likely based on the current trajectory for renewable energy installations and grid improvements (Vance et

al., 2025). This means that despite high electrolyser costs, green hydrogen is already cost-competitive in Ireland due to the high availability of zero-cost power² from curtailments in the next 15 years. However, **RESS contracts must be clarified to facilitate the transfer of the surplus renewable power which would otherwise be curtailed to the hydrogen producer.** One option would be for the transmission system operator (TSO), rather than request the power to be curtailed, transfer the electricity to hydrogen electrolyzers located at strategic network points (Figure 2, Option A).

Early electrolyser demonstration projects using surplus power can be initiated by state bodies such as EirGrid, ESB, or GNI. For businesses, domestic market incentives should be clarified. For example, businesses can operate electrolyzers during off-peak hours to make use of low-cost electricity, then use hy-

drogen during peak hours to provide demand-side flexibility. Future policy frameworks therefore need to **specify the market conditions for hydrogen producing electrolyzers connected to the power grid so that along with producing certified green hydrogen they can offer balancing and operating reserve system services** (ENTSO-E, 2022). Green hydrogen as a flexibility provider is being examined in New Zealand through the Fortescue project (Energy Efficiency & Conservation Authority, 2025) and in Greece, Spain, and Austria through the Horizon 2020-funded project Demo4Grid (Stamatakis et al., 2025). However, currently there is no guidance on how this could look in Ireland. Opportunities might become clearer with the introduction of dynamic pricing in Ireland from June 2026, where the wholesale electricity prices for each half-hourly period will be announced 24 hours in advance (Breen, 2025).

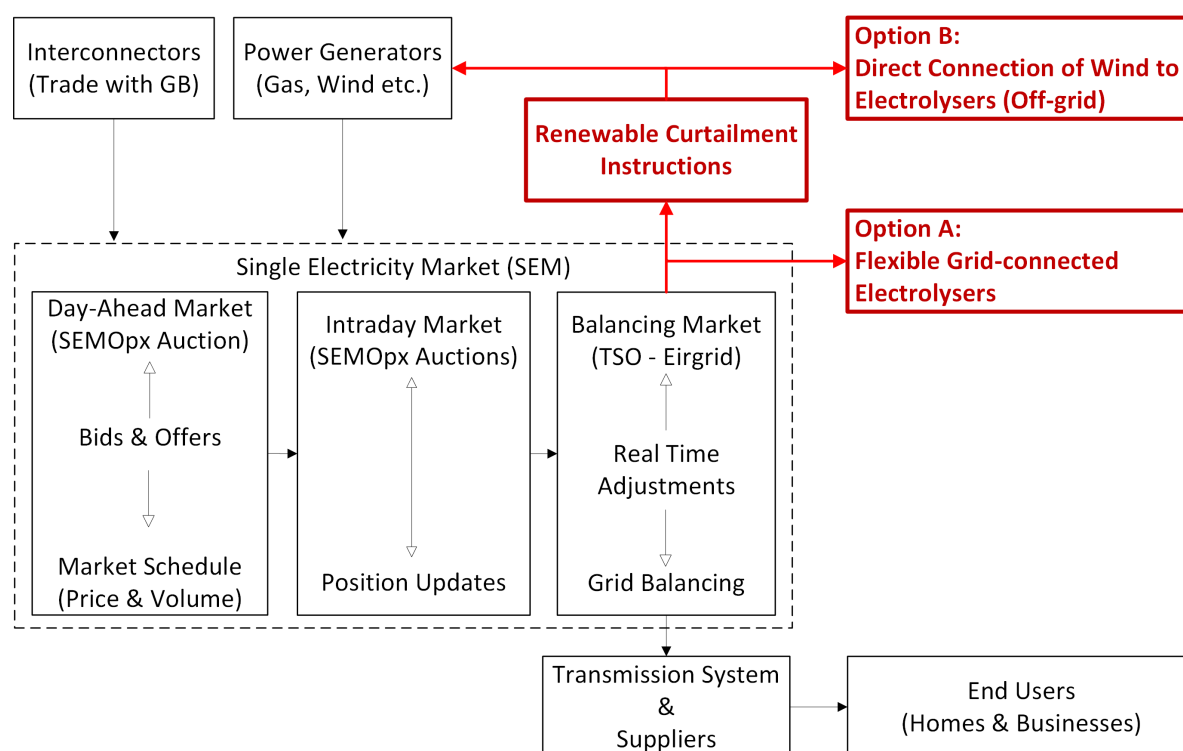


Figure 2: Diagram of the business model for supplying curtailed power to hydrogen production.

²Excluding any connection costs.

Aside from the specific market opportunity mentioned above, hydrogen can be produced using a direct connection between the renewable energy supplier and the electrolyser (Figure 2, Option B). However, hydrogen production from this option is expected to cost a minimum of 3–4 €/kg, or 90–120 €/MWh (Moran et al. 2023). By comparison, the cost of natural gas in Ireland is 15–60 €/MWh for non-household consumers (Eurostat, 2024). Using green hydrogen to replace natural gas results in direct emissions savings of approximately 350–410 kg CO₂eq/MWh (Turconi et al., 2013), and these emissions savings result in direct financial benefits through the EU's Emissions Trading System (ETS). However, the current price for EU ETS permits is only 75 €/tonne CO₂eq (Twidale, 2025), which is not nearly high enough to enable market competitive-

ness with natural gas (Figure 3). The carbon price would need to be 2–3 times higher (150–200 €/tonne) to directly compete with natural gas prices.

Given the high carbon prices needed to enable green hydrogen to compete with natural gas on the open market, additional funding is needed to facilitate the development of hydrogen projects. Internationally, there are already several policies in place for providing financial support for green hydrogen production and consumption. In the UK and Japan, a Contract-for-Difference (CfD)-type subsidy is available for low-carbon hydrogen, which covers the difference between the strike price, which is based on the LCOH, and reference price, which is based on the cost of conventional fossil fuels (Nishimura & Asahi, 2024).

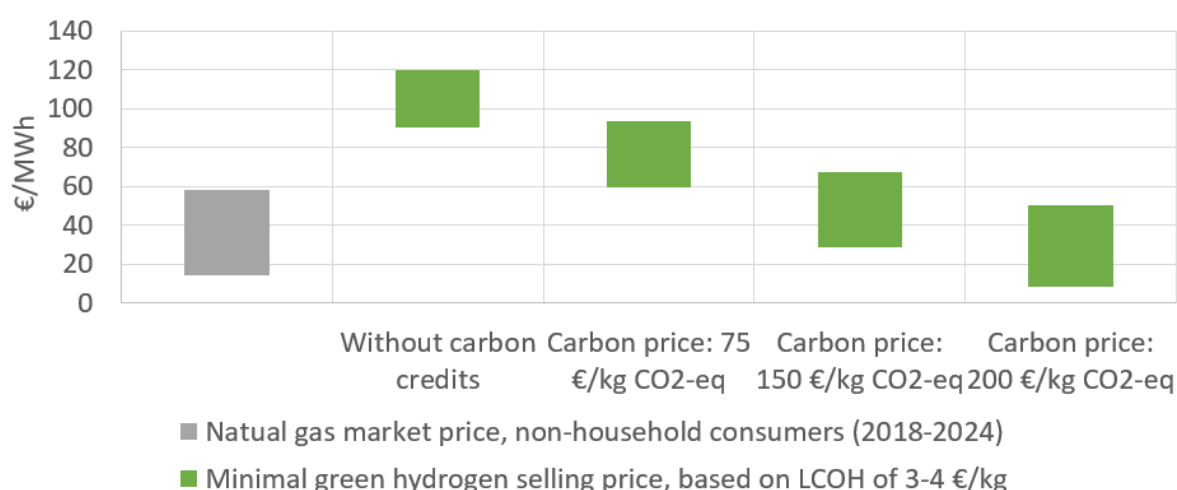


Figure 3: Comparison of natural gas prices and green hydrogen prices considering different carbon prices.

Within the EU, the European Hydrogen Bank (EHB) has been operating a 'pay-as-bid' auction since 2023 in which European producers can bid for a subsidy per kg of hydrogen produced, with the winning bids under 0.48 €/kg (European Commission, 2024). Through this auction system the EHB has already financed €2.8 billion of European green hydrogen projects since 2024, with another €1 billion planned for the end of 2025 (European Commission, 2025). Thus far, no Irish projects have been awarded subsidies through the

EHB. Furthermore, there has been no clear indication from the Government that Ireland will utilise the EHB's Auctions-as-a-Service scheme, which is available to member states (European Commission, 2024). Countries such as Spain, Lithuania, and Austria have accessed an additional €1.1 billion for national hydrogen projects through this option (European Commission, 2025). **It is highly recommended that the Irish Government applies for this scheme to help support green hydrogen projects in the country.**

Finally, pilot projects are necessary to provide confidence in developing technologies, enabling external investment which is heavily needed for realising large-scale projects. However, there are currently no national funding mechanisms for hydrogen pilot projects in Ireland (Bord na Móna, 2024). By comparison, Germany has already allocated €154 million to their hydrogen innovation and technology centres (Fuel Cell Works, 2025), while the Netherlands has provided €838 million to its green hydrogen transition programme (GroenvermogenNL, 2025), which includes research and development, pilot and small-scale demonstrations, and scaling-up programmes. **To remain competitive in Europe and globally, Ireland needs to ramp up support for early-stage hydrogen projects, potentially by establishing a targeted innovation fund.**

5 Summary of Policy Recommendations

Ireland's current short-term emission reduction strategies do not rely on hydrogen. Nevertheless, to meet its long term decarbonisation targets, the Government should aim to initiate hydrogen production and consumption now, so that Ireland can take full advantage of its renewable resources as they are developed. The vision for hydrogen in the long term is outlined in the National Hydrogen Strategy, but the path is filled with significant uncertainties regarding its execution. Both short- and long-term plans for hydrogen create a necessity to establish legal and market regulations well before 2030. Permitting hydrogen in the gas network up to 20% provides an immediate outlet for any hydrogen produced but without any premium. Making hydrogen cost competitive with other energy sources through certification, market reform and financial support then allows users with an interest in decarbonising through hydrogen to build their own business case, and invest in hydrogen technologies. We suggest the following policy recommendations to kick start Ireland's hydrogen sector:

Regulation

- Begin coordinated work with the United

Kingdom to raise the current 0.1% by volume hydrogen blending limit to a minimum of the EU's 2% interconnection requirement and prepare for higher levels in line with technical evidence, while finalising domestic safety standards and supporting early regional hydrogen clusters.

Certification

- Create a national hydrogen certification scheme aligned with EU RFNBO standards to ensure market access, build investor confidence, and guarantee low emissions integrity.
- Implement a lifecycle carbon-intensity threshold ($\leq 3\text{--}4 \text{ kg CO}_2\text{eq/kg hydrogen}$) to ensure all hydrogen in Ireland, domestic or imported, meets low-carbon standards.
- Ensure alignment with EU and UK schemes by embedding lifecycle GHG accounting, additionality, and temporal/geographic correlation in line with RED III and Delegated Regulation 2023/1184.

Market Reform

- Implement critical energy market reforms within the Single Electricity Market (SEM) to enable the electrolyzers to access surplus renewable electricity and allow electrolyzers to provide valuable grid services.
- Introduce long-term revenue support schemes to de-risk private investment in renewable hydrogen production and use.

Financing

- Begin targeted financing of pilot projects to de-risk early-stage investments, test new applications, and gather essential data to guide the long-term, evidence-based deployment of a large-scale hydrogen ecosystem, along with developing an indigenous hydrogen industry.
- Establish a dedicated national hydrogen

fund that leverages the EHB's 'Auctions-as-a-Service' scheme, alongside exchequer support, to build a domestic supply chain.

Beyond 2030, the certification process should expand to cover the full lifecycle, including transport and storage emissions, while ensuring mutual recognition with global schemes. Additionally, it is suggested to implement targeted financial schemes for projects focused on large-scale green hydrogen production

and utilisation, particularly within transport. While every effort should be made to maximise value from the financial supports, it should also be accepted that these are investments and come with a high degree of risk. Thus, recommendations beyond 2030 will depend on the progress in the coming years both in Ireland and internationally. Continual re-evaluation of policies will be necessary to adapt to changing market conditions, technology developments, and ensure alignment with European directives.

Table 1: Summary of Near Term (Before 2030) Recommendations

Area	Recommendation	Responsible entity
Regulation	Amend national gas quality regulations to allow phased hydrogen blending, starting with the EU 2% interconnection requirement and progressing towards up to 20% in distribution networks, with 100% hydrogen in regional clusters , supported by safety and technical evidence.	CRU in coordination with GNI and NSAI
Regulation	Facilitate development of intra-cluster hydrogen pipelines (e.g. in Cork, Shannon, Dublin and Galway) by 2030, supported by technical standards.	DCEE in collaboration with GNI and NSAI
Certification	Create a national hydrogen certification scheme aligned with EU RFNBO standards to ensure market access, build investor confidence, and guarantee emissions integrity.	DCEE
Market reform and financing	Establish dedicated market mechanisms and contractual frameworks within the Single Electricity Market (SEM) to facilitate the direct off-take of surplus renewable electricity by hydrogen producers.	CRU, DCEE, in coordination with EirGrid, SEMO, and industry participants
Market reform and financing	Develop and implement specific electricity market and regulatory frameworks within the Single Electricity Market (SEM) that encourage electrolyzers to actively participate in and financially benefit from providing grid services , such as fast frequency response, reserve, and demand-side flexibility, to EirGrid for system balancing.	CRU, DCEE, in coordination with EirGrid, SEMO, and industry participants
Market reform and financing	Introduce a support scheme by 2028 for renewable hydrogen producers, using EU funding tools like IPCEI and REPowerEU to bridge cost gaps and provide long-term price certainty.	DCEE, Department of Finance
Market reform and financing	Establish a national fund through the EHB or alternative mechanisms for co-funding pilot and early hydrogen projects, de-risking private investment.	DCEE, Department of Finance

6 Conclusions

There is an opportunity for developing a green hydrogen market in Ireland, as highlighted by the National Hydrogen Strategy. However, the Government's National Hydrogen Strategy is not clear on several important issues, which we highlight in this paper. In the long term, carbon budgets and the availability of energy imports will be very influential on hydrogen deployment. However, the priority of Ireland in terms of hydrogen export vs. energy sufficiency should be clarified, and its dependence on the development of the offshore wind market must be acknowledged. In the short term, we encourage policies which will enable the most cost-competitive pathway for hydrogen production using curtailed power. To facilitate hydrogen demand, we suggest the establishment of a framework for green hydrogen certification, updating gas network regulations to enable higher proportions of blending within existing gas infrastructure, and enabling the development of a hydrogen economy through electricity market reform and early-stage project financing. By implementing these recommendations, Ireland can move decisively from strategy to action, unlocking its renewable gas potential.

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Cover photo description: 1 MW scale electrolysis plant at the H2 Terminal (<http://hydrogen-terminal.de/>) in Braunschweig, Germany. Credit: Charlene Vance.

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