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REPORT: THE HYDROGEN SECTOR IN IRELAND

SUMMARY OF THE SECTOR,
PROFESSIONS, AND SKILLS

CONTENTS

<i>Summary of the hydrogen sector and market in Ireland</i>	<i>3</i>
<i>Current hydrogen strategy based on EU regulations and Ireland's policy.....</i>	<i>5</i>
<i>Professions and jobs within the hydrogen sector in Ireland.....</i>	<i>7</i>
<i>Competencies required by professionals in the hydrogen industry in Ireland.....</i>	<i>9</i>
<i>Sources.....</i>	<i>13</i>

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SUMMARY OF THE HYDROGEN SECTOR AND MARKET IN IRELAND

Ireland's decarbonisation strategy focuses first on energy efficiency and then electrification; for sectors that are difficult to decarbonise, it then targets low-carbon and renewable fuels, such as hydrogen. Compared to several other countries, Ireland has a different starting point for its hydrogen demand. Compared to a few other European countries that already consume large amounts of hydrogen sourced from fossil fuels with high emissions intensity, Ireland currently has a very low end-use of hydrogen.

With a sea area roughly seven times larger than its landmass, Ireland boasts one of the most productive coasts in Europe and some of the world's best offshore renewable energy resources. Ireland has a great chance to become less dependent on imported fossil fuels and possibly even achieve energy independence by using this renewable energy to produce renewable hydrogen.

Hydrogen's high energy density as a gaseous fuel makes it an excellent choice for large-scale seasonal storage applications. These applications can help control the seasonality of demand patterns throughout the year and the variability of renewable energy sources like solar or wind. Today, renewable energy sources are backed up by fossil fuels, but in the future, renewable hydrogen may provide a zero-carbon substitute. In order to support Ireland's energy security going forward, the National Energy Security Framework acknowledged this and called for the creation of a National Hydrogen Strategy.

Ireland will have to develop and expand its existing hydrogen demand uses, which are not very prevalent at the moment. In Ireland specifically, hydrogen is expected to be a major factor in the decarbonisation of industrial processes as well as a fuel for transportation in industries like heavy haulage, shipping, and aviation in the years to come. The development of pure hydrogen applications in these challenging to decarbonise sectors will take precedence. Resources and policy support won't be directed towards industries where decarbonisation alternatives are more practical and effective.

Although Ireland has the resources to produce substantial quantities of hydrogen from renewable sources, it will take time to install the necessary onshore and offshore renewable energy sources on a large enough scale. Prior to 2030, hydrogen will be produced from grid connected electrolysis from surplus renewables and will focus on small scale decentralised applications such as freight, with small scale production driven by early innovators, research, and demonstration projects.

In addition, a 2 GW target for offshore wind energy to be developed by 2030 for the production of renewable hydrogen will help to reassure investors and generate the volumes required to grow the industry. Ireland possesses large offshore wind resources, and in the long run, it may be able to become a net exporter of renewable hydrogen and establish a decarbonised industrial opportunity close to this resource. Currently, Ireland has 77 offshore wind farm projects of which 1 currently operating[1], and over 300 land-based wind farms[2]. There is a possibility of the wind and hydrogen sector working together to produce green hydrogen as the sector progresses.

The cost of renewable electricity and the capital costs of electrolyzers are the two main factors influencing the costs of producing hydrogen using renewable energy. Because of increased technological advancements, both costs have decreased significantly in recent years and are expected to continue to do so. Ireland has some of the world's most energy-productive renewable energy resources, and the competitiveness of Irish-produced renewable hydrogen will increase significantly as a result of these declining costs.

In addition to electricity, a significant amount of water is needed for electrolysis. Ireland should not have any major problems getting the amounts of water needed to make renewable hydrogen. For instance, it is predicted that providing 2 GW will require less than 1% of Ireland's present water supply, leaks included in it. Furthermore, water can be obtained from nearby supplies like streams, aquifers, and rainfall. Desalinating seawater is another option, and this is especially significant when producing hydrogen from renewable offshore sources.

Currently, the hydrogen sector is still at an early stage with many standards still under development, with no hydrogen safety strategy or framework. There is a fear that red tape could halt the progress of the hydrogen sector in Ireland, however many recommend starting with a voluntary safety framework before progressing onto testing and refinements using feedback, to then create a legally binding regulatory framework.

[1] <https://www.4coffshore.com/windfarms/ireland/>

[2] <https://windenergyireland.com/about-wind/the-basics/facts-stats>

CURRENT HYDROGEN STRATEGY BASED ON EU REGULATIONS AND IRELAND'S POLICY

Although renewable hydrogen has the potential to present Ireland with many opportunities, it is still an emerging technology with many unknowns regarding future costs, possible applications, and the supply chains, infrastructure, and skills required to make it happen. By offering a long-term strategic vision of the role hydrogen will play in our future economy, the National Hydrogen Strategy seeks to mitigate some of this uncertainty. This will ultimately help to drive investment from the private sector with lowering commercial risk. In the short term, this strategy lays out a number of initiatives that will be implemented over the next few years in order to support the growth of Ireland's hydrogen industry.

These initiatives seek to eliminate any obstacles that might prevent early hydrogen projects from moving forward in the present and to advance our understanding through focused research and innovation along the entire value chain. The National Hydrogen Strategy represents a significant turning point in the industry's growth as Ireland's first comprehensive policy statement on renewable hydrogen.

The National Hydrogen Strategy assesses both the long-term needs and short-term actions to enable hydrogen to develop across the entire value chain, aiming to address multiple questions regarding the Hydrogen industry in Ireland. There are still questions regarding how Ireland will kickstart and scale up production of renewable hydrogen, which end-use sectors will hydrogen be targeted towards (aviation, freight, public transport?), or what quantities are likely to be needed (to support specific industries, produce extra quantities to sell on the international market, or carry out a large scale changes in Irish energy?). It is still unknown what infrastructure Ireland needs to support the development of the hydrogen sector (including transportation and storage) and how this development will commence. As discussed in the next section, a large amount of construction workers and engineers will be necessary to carry out this transition. Finally, Ireland must ensure necessary safety, environmental and market rules are in place to enable the sector to grow in a safe and sustainable way, in the country and in Europe.

[3] <https://assets.gov.ie/263248/f982c10f-eca6-4092-a305-90000e5213ed.pdf> p.4

An edited extract from the ‘Summary of Major Policy Statements relevant to the National Hydrogen Strategy’ (p.14-15[4])

Climate Action and Low Carbon Development (Amendment) Act 2021: commits Ireland to a legally binding target of a climate neutral economy no later than 2050, and to a reduction in emissions of 51% by 2030, providing a framework to meet these targets.

Climate Action Plan 2023: sets out how Ireland can accelerate actions required to respond to the climate crisis, putting climate solutions at the centre of development. The Plan sets out that decarbonised gases such as renewable hydrogen will be a critical component for Ireland’s energy ecosystem and in minimising the overall cost of decarbonisation across all sectors. The Plan’s KPIs include renewable hydrogen in production from surplus renewable electricity by 2030, zero emission gas fired generation commencing by 2030, and renewable hydrogen production via 2 GW of offshore wind under the 2031-2035 measures.

Long-term Strategy on Greenhouse Gas Emissions Reductions: builds upon the decarbonisation pathways set by carbon budgets, sectoral emissions ceilings and Climate Action Plan 2023, to ensure coherent and effective climate policy. It sets out indicative pathways, beyond 2030, towards achieving carbon neutrality for Ireland by 2050.

National Energy Security Framework: prioritised the development of a hydrogen strategy for Ireland.

Government Statement on the Role of Data Centre in Ireland’s Enterprise Strategy: highlights the CRU Decision (CRU/21/124) that new data centre connections are required to have on-site generation (and/or battery storage) that is sufficient to meet own demand and assist in full decarbonisation of the power system.

Ireland’s Road Haulage Strategy 2022-2031: focuses on improving standards, securing jobs and helping the road freight sector move to a low-carbon future. Under Action 14 of the Strategy, the role that hydrogen can play in the decarbonisation of heavy goods road freight is to be part of the development of the National Hydrogen Strategy.

Shared Island Initiative: Both Ireland and Northern Ireland now have common carbon emission reduction goals and statutory requirements. The cross-border connections provide important opportunities for strategic cooperation on green energy transition on a shared island basis. The revised National Development Plan (2021-2030) includes a priority on exploring potential cross-border and all-island approaches on renewable energy, including on the potential of hydrogen power. Both Administrations are supporting a feasibility study to assess the potential to establish hydrogen refuelling stations along the main road network between Dublin and Belfast.

[4] <https://assets.gov.ie/263248/f982c10f-eca6-4092-a305-90000e5213ed.pdf> p.14-15

PROFESSIONS AND JOBS WITHIN THE HYDROGEN SECTOR IN IRELAND

The market for hydrogen mobility is growing, which implies that infrastructure and vehicle costs are coming down swiftly and that there are more and different kinds of hydrogen-powered vehicles on the road. Ireland's hydrogen mobility option will become more affordable thanks to advancements made in other nations. This enables Ireland to move directly to projects at a scale that can be profitable for investors, bypassing small-scale demonstration projects.

As the development of safety legislation for 100% hydrogen begins, the appointment of a safety regulator may occur. This would likely be based on energy health and safety professions with specific details in hydrogen. However, since there is no legislation yet it can be difficult to predict the specificity of this job. Leadership as a competence will be essential from both Governmental entities as well as the private sector to ensure this profession can cope with the hydrogen demand in early infrastructure.

Gavin & Doherty Geosolutions Ltd (GDG) was commissioned to critically examine the potential for hydrogen produced by wind turbines to assist in Ireland's transition to a low-carbon energy system. Their report explores and outlines both the challenges – technical, economic, and policy – and opportunities associated with the development of a wind-based green hydrogen industry in Ireland. A sustainable and competitive hydrogen industry is an opportunity for Ireland to strengthen its economy and support future-proofed jobs, where 60% of respondents have already started hiring for hydrogen-specific roles[5]. These stakeholders anticipate hiring across a range of skill levels and skill sets but have already noticed a gap in the available knowledge, training, or skills.

As the green hydrogen industry develops, significant employment opportunities are likely to arise in construction and skilled technical roles. Future hydrogen jobs that are expected (and which will require skills development) include operation and maintenance of the technologies (electrolysers, fuel cells, combustion systems, etc.), transportation and delivery of hydrogen, compression and storage, and gas grid injection among others.

Long term employment opportunities are likely to be found with the provision of services and expertise to the global green hydrogen industry, in addition to the operation of facilities. It's also worth noting that while hydrogen is no more or less dangerous than other fuels, it is very flammable and requires safety concerns that are different from those used today. The future hydrogen workforce will have to be fully prepared and competent to work with hydrogen in a safe manner.

[5] <https://www.skillnetireland.ie/wp-content/uploads/2022/01/WindEnergy-Hydrogen-Offshore-Report-Green-Tech-Skillnet.pdf>

At EU level, green hydrogen could create up to 1 million direct, high-quality jobs by 2030 and up to 5.4 million such jobs by 2050[6]. This works out to be ca. 10,300 jobs per €1 billion invested and includes jobs generated in the renewable electricity sector. In Ireland, this would translate to between 80 and 600 new jobs in the green hydrogen industry by 2030, with a further 170 to 1200 indirectly related to the sector[7].

However, Ireland is already experiencing a shortage of workers across the economy. One of the hardest hits sectors is the Irish construction industry. Our survey indicated that many of the potential hydrogen jobs will be in the technical/ construction sector, meaning there will be increased competition with the housing construction sector for skilled labour. This is at a time when the new “Housing for all” plan states that up to 80,000 workers, or double today’s numbers, are required to meet the new targets it has set, further straining the supply available to any potential hydrogen industry[8]. Therefore, the requirement for a large number of workers may provide a barrier to development. Reskilling of workers in the petroleum and peat industries could play a critical role in addressing any potential shortages.

Ireland's research-performing organisations receive substantial funding from the government to conduct policy-relevant and climate-related research in the humanities and sciences. These organisations actively seek funding for climate-related research from different European fundings. This means many research professions will continue to be available as the hydrogen sector emerges in Ireland, with a focus on international cooperation between research fellows and universities.

HySkills, funded by Erasmus+ and launched in 2020; a Europe-wide project to deliver technical and practical knowledge in hydrogen with Dublin City University as a partner organisation[9]. HySkills highlighted that skills shortages are already evident across most engineering and manufacturing sectors, and the emerging hydrogen sector is at risk of a skilled worker shortage. Over 60% of respondents answered that that it is not easy to find qualified/skilled professionals operatives. The HySkills report found that companies with hydrogen skills needs generally upskill their workers via internal training and various short courses. One of the report’s findings is that “all personnel who will be working with or around hydrogen should be adequately trained on hydrogen safety procedures; however, the findings from questionnaires and one to one interview(s) found a range of definitions on the term trained”. This shows a lack of knowledge and skill standardisation across professionals working in the hydrogen sector in Europe. Ireland will be key here to establish high but also accessible training standards for hydrogen professionals.

[6] <https://op.europa.eu/en/publication-detail/-/publication/0817d60d-332f-11e9-8d04-01aa75ed71a1/language-en>

[7] <https://www.skillnetireland.ie/newsroom/green-hydrogen-talent-development-for-the-jobs-of-tomorrow>

[8] <https://www.skillnetireland.ie/newsroom/green-hydrogen-talent-development-for-the-jobs-of-tomorrow>

Ireland will need to facilitate the skills development and training necessary for jobs in the hydrogen sector. In the short term, many of the potential new offshore wind and hydrogen economy jobs will be in the construction sector. In the longer-term process, as the hydrogen industry expands, health and safety roles will be a big aspect in the sector. Other key skills needed for the offshore wind and hydrogen economy include technical roles such as civil, electrical, chemical, and geotechnical engineering, alongside support functions in areas like logistics and supply chain management, sustainable finance, and health and safety.

COMPETENCIES REQUIRED BY PROFESSIONALS IN THE HYDROGEN INDUSTRY IN IRELAND

As described above, the range of professions and jobs is very large ergo the range of competencies required by professionals is just as varied. Using various sources mentioned at the end of the document, as well as job postings for a CEO for Hydrogen Ireland and a Research Fellow in hydrogen storage and gas grid analysis at Dublin City University, an overview of general competencies has been created.

General characteristics:

- Accountable
- Professional
- Credible, in terms of references
- Ability to work as part of a team or individually as required
- Ability to create and develop good working relationships
- Ability to set own high standards of performance and delivering desired results
- Strong problem-solving abilities
- Willingness to explore further opportunities as they emerge
- Proven research independence
- Excellent written and oral English
- Proven ability work to strict deadlines
- Proven ability to work under pressure and in an unknown situation

Professional Experience:

- BA/sc, MA/sc, PhD (ie. Level 6 or above) in Engineering or similar areas
- Research grant writing
- Student supervision
- Project management
- Work in industrial settings
- Identification and assessment of internal and external issues that affect the hydrogen sector in Ireland
- Conference planning and organisation of events
- Proven analytical, problem solving and consensus building skills
- Dealing with a variety of stakeholders, including senior management and shareholders, as well as the general public, across a large organisation

Communication skills such as:

- Overseeing the development of a communications plan to utilise across stakeholders
- Collaboration with other energy trade bodies to advocate and represent in discussions and approaches to government, regulatory bodies and trade sectors
- Liaising with industry partners and national as well as global networks and clusters to gather knowledge or insights on best practice
- Presentation of relevant communications to target audiences for project results
- Ability to inform others about internal/external issues affecting the hydrogen sector

General knowledge such as:

- Supply chain aspects
- Develop scenarios in the gas grid (e.g. grid injection)
- Develop scenarios for hydrogen storage technology (e.g. gas grid, tank and geological applications)
- Develop proposed required enablers and solutions to obstacles modelled, focusing generally on management practice, logistics, and supply chains
- Good understanding of the hydrogen and energy space in Ireland & Europe
- Related expertise in current policy and policy formation, specifically clean energy and utilities
- The EU funding landscape, including identification of external funding sources
- Computer skills, including updating websites, social media posting and understanding of communications online

Technical and specialised knowledge such as:

- Supply chain aspects
- Hydrogen production methods
- Hydrogen storage
- Challenges in hydrogen distribution
- Technical readiness of the network to transport hydrogen
- Knowledge and skills of safe transportation and storage of hydrogen on the gas network in the future.
- Asset management for hydrogen blending and injection facilities
- Assist in the writing of grant proposals
- Green hydrogen safety skills
- Logistics: Expanded gas grid, hydrogen storage and logistics, Ireland, UK, EU, gas grid analysis (transmission, distribution, local grid, bottled gas)
- Optimise hydrogen in the gas grid (e.g. grid injection)
- Model demand scenarios (e.g. heat, peaking plants, datacentres)
- Model scenarios for hydrogen storage technology (e.g. gas grid, tank and geological applications)
- Develop itinerary/database of infrastructure obstacles, risks and bottlenecks to the above scenarios
- Develop proposed required enablers and solutions to obstacles modelled, focusing specifically on hydrogen
- Carry out sensitivity testing and alternate scenarios, using management practice as well as computer based scenarios

Leadership and management skills such as:

- Aiding with net-zero transition of the public transport sector, with the idea to help stimulate action from the private sector
- Building a deep understanding of key stakeholder, industry and regulatory pressures and demands, to communicate those to necessary divisions of the organisation
- Leading and executing a strategy for Ireland's hydrogen industry
- Providing strategic future-based guidance for the organisation and its stakeholders
- Forming and executing strategy
- Mentoring and supervising staff
- Directing the implementation of a communications document management platform
- Ability to lead related sub tasks and deliverables in other work-packages or projects

It is recommended to particularly focus on health and safety specific competencies in the hydrogen sector, as there are no specific regulations in the hydrogen sector in the European Union yet, with organisations in Ireland working on recommendations or privately created standards, including the new guidance document published by EHSP. The European Hydrogen Safety Panel (EHSP) has published a new guidance document for the Safety Planning and Management in EU hydrogen and fuel cell projects as well as new guidance document on Hydrogen Safety Engineering. This is based on the same documents published in 2021, with the updated 2023 versions providing further information on safety planning, monitoring, and reporting for hydrogen and fuel cell projects in Europe [10].

This includes specific health and safety competencies such as:

- Identification of safety vulnerabilities and suggesting elimination or control of hazards
- Introduction of mitigation measures to keep the risk at an acceptable level
- Development of innovative engineering solutions

As well as competencies which include leadership and communication skills such as:

- Ability to appropriately communicate on safety issues between the project consortium and external parties, as well as describing those in the safety plan of the organisation, including how the plan will be implemented, its monitoring, and reporting as required
- Managing the periodic revision of the codes to reflect new knowledge in the hydrogen sector and best practice

Furthermore, it should be noted that since hydrogen technologies are part of a new and emerging sector, soft skills will be just as important as hard skills during the development of this sector, to appropriately and effectively communicate and manage between stakeholders. Professions within the hydrogen sector in Ireland and EU are varied and some not yet created. Therefore it is critical workers in this sector hold strong interpersonal skills to effectively share and utilise technical knowledge on hydrogen.

[10] https://www.clean-hydrogen.europa.eu/media/news/interested-hydrogen-safety-2023-06-07_en

SOURCES

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