

Reply to:

Public Consultation to inform a Grid Development Policy for Offshore Wind in Ireland

Dear Energy Division,

As **Assistant Professor of Dublin City University** & as chair of Hydrogen-Ireland, I welcome the opportunity to feed information into this consultation to enable Government to set a clear direction for managing Ireland's resources, clarify objectives and priorities, and direct decision makers, users and stakeholders towards a more sustainable, environmentally and ecosystem focused, strategic, efficient and forward thinking use of our marine & wind resources.

In my position in the School of Mechanical & Manufacturing Engineering at **Dublin City University**, I am actively involved with energy-related education, research and development. The main aim of my research is to develop a better understanding of the technologies, strategies and economic models required to achieve Paris aligned national & global ambitions to mitigate the major effects of Global Climate Change. Focusing on clean, low-cost, sustainable energy for households, industry and for transport, interacting with renewable energy, hydrogen and storage technologies, I have ongoing projects with Irish & EU academic & industry partners and government bodies such as Enterprise Ireland & Sustainable Energy Authority of Ireland (SEAI). I am an advisor to the World Energy Council Hydrogen taskforce. I am a hydrogen expert to the United Nations Economic Commission for Europe taskforce on the role of hydrogen in attaining carbon neutrality in the UNECE region.

Hydrogen-Ireland is a not for profit association formed in 2019, on the back of a growing interest from industry, in Hydrogen, the technology, and its potential application in the energy, transport and industry sectors to assist with the transition towards a zero carbon economy. Our members are from across the economy in Ireland (north and south of the border) semi-state companies and organisations, SMEs, large corporate companies, large energy users, multinational companies, large energy producers, etc. Some members want to be updated on hydrogen, some want a solution for their energy problem, others want to be educated on new technologies so that they are ready for an energy transition where hydrogen is centre stage.

My role as chair of Hydrogen-Ireland is to listen to the voice of our members and partners; to inform and share information with communities, industry, government & EU representatives; to support safe hydrogen technology development, demonstration and scale up on the island or Ireland; to achieve carbon emissions reductions; to support the creation of hydrogen jobs & IP; and allow Ireland become a leader in hydrogen in Europe.

I have commented on specific questions of the Framework in the following section and also have an introduction section on hydrogen for your information. I am available to be contacted to clarify any topic or answer any questions you may have.

Kind Regards,

Question 1-8, 12, 14, 15: N/A

9) How important is it for Ireland to develop an indigenous offshore wind energy industry? How best can an indigenous industry be developed?

As a nation of Ireland, as part of Europe and as an inhabitant of planet Earth we must reduce our emissions and slow the devastating impact of Global Climate Change and related biodiversity collapse, or we will not have the resources we cherish so much today.

Indigenous offshore wind energy can enable a vast renewable supply of energy (electricity and other energy carriers e.g. hydrogen) for the country and for export creating local jobs and new economies.

Adaptation of port facilities to support offshore development, e.g. Moneypoint or Tarbert or Cork Harbour, Dublin Port, Rosslare and the repurposing of decommissioned offshore infrastructure e.g. Kinsale is welcomed as it reduces green field destruction and creates local jobs.

Rural Coastal and Island Communities interest to access or develop renewable energy or energy self-sufficiency or sustainability of rural coastal and/or island communities should be supported.

10) How should onshore and offshore grid connections be optimised? For example, should consideration be given to common hubs for adjacent projects?

Ireland with a small population and with one of the biggest potential for offshore wind in Europe has the potential to be totally energy secure using indigenous resources, backed up by interconnection to Europe.

Continue with interconnection on a cost benefit basis, it will be needed to export surplus electricity as we approach 100% renewables.

Hydrogen is a key sector for Ireland, and for the marine industry, enabling the energy transition to full decarbonisation, coupling major parts of energy sector to achieve 100% renewables. Hydrogen must be added to any grid development plan. Excess energy should be storage don the island via Power-to-Gas or Power-to-Chemicals or Power-to-X.

See project looking at Germany requiring huge amounts of Hydrogen for its industry, Ireland could even export hydrogen and be a supplier of energy to Germany: <https://www.frontier-economics.com/media/2642/frontier-int-ptx-roadmap-stc-12-10-18-final-report.pdf>

11) Are there any further considerations which might reduce the cost to the consumer?

Imagine it was cheaper to pipe a fuel than lay a cable to supply energy to a customer. It is!

Imagine you could supply more energy in a pipe than in a cable to supply energy to a customer. You can!

Not all offshore wind sites will or should be connected to land via cable. Some offshore wind sites will and should be developed to produce hydrogen or other energy carriers.

With ever increasing renewable energy penetration, grid access and cable costs are getting more difficult and more costly. For example onshore, prime solar sites are many km's from a suitably large

enough grid substations and the cost of reinforcing the cables/substation is many times the cost of the solar plant. The same issues arise with prime wind sites across Ireland, and of course offshore wind.

For Ireland, there are clearly identifiable pathways to transition the great majority of its energy requirement to proven indigenous zero- or negative-carbon energy sources (primarily wind, solar, and sustainably cultivated indigenous bioenergy). This does require, the development of large scale (**multi-TWh**) energy storage facilities to buffer variability on at least an annual basis.

Such energy storage is technically feasible, using well proven conversion and storage technologies, through the use of hydrogen as the vector to produce gaseous and/or liquid “electrofuels”: Power-to-Gas or Power-to-Chemicals or Power-to-X; hydrogen, ammonia, possibly synthetic hydrocarbons (with carbon cycling), all produced primarily from indigenous variable renewable energy sources.

The basic technology to produce hydrogen is water electrolysis, where DC current is passed through water to produce hydrogen and oxygen. Hydrogen is being pursued as a sustainable energy carrier for fuel cell electric vehicles (FCEVs), stationary fuel cell systems for buildings, backup power, or distributed generation, and as a means of increasing the output of renewable energy systems such as large wind farms and storing renewable energy at utility scale, shifting some variability caused by intermittent renewables on the electricity grid onto the gas grid.

13) Are there any further drivers which should be considered when assessing a grid delivery model suitable for offshore wind development in Ireland?

Hydrogen.

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There are greater than 30 developments of 5-10MW electrolysis projects in Europe producing hydrogen from wind or solar for many applications [<https://www.frontier-economics.com/media/2642/frontier-int-ptx-roadmap-stc-12-10-18-final-report.pdf>] [<http://europeanpowertogas.com/projects-in-europe/>]

Production of renewable hydrogen is a key enabler to deliver renewable natural gas and offers huge potential as a precursor vector in future sustainable energy systems, transport (synthetic CNG/H₂ transportation), heating (methanation of CO₂), and power generation displacing fossil fuel natural gas. Greening the natural gas grid by direct injection of H₂ (in limited quantities at specific sites) is already a feasible option [<http://www.certifyh.eu/>].

In a recent report on Ireland by the IEA some comments are note-able: [IEA, Ireland, 2019]

- “The Irish government should intensify research on hydrogen”
- “Emerging international research areas such as those relating to hydrogen also offer potential benefits and align well with the Irish resource endowment and its energy sector policies.”
- “The efforts to decarbonise the Irish gas infrastructure by the admixture of biomethane could potentially be supported by the use of hydrogen.”

Support for renewable hydrogen in planning is important. Strategic planning decisions support Irish businesses to develop knowledge, intellectual property and early hydrogen deployment projects across the country, overcoming economic and social barriers so that by 2030 Ireland is positioned to assist in achieving the targets set to achieve our energy system decarbonisation goals.

While the hydrogen or electro-fuel production is challenging in terms of technology maturity and immediate investment cost, this is true of all decarbonisation pathways that might credibly be commensurate with meeting the Paris climate goals. Hydrogen however has the unique advantages of high confidence in the effectiveness of decarbonisation and relatively rapid achievement of very high national energy security. Such a rapid fossil fuel phase out would additionally bring very significant co-benefits in balance of payments and overall national social and economic resilience.

References:

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H Deng, et al. Leakage risks of geologic CO₂ storage and the impacts on the global energy system and climate change mitigation <https://link.springer.com/article/10.1007/s10584-017-2035-8>

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The role of power-to-gas in the future energy system: Market and portfolio effects by Muireann A. Lynch (ESRI and Trinity College Dublin), Mel Devine (University College Dublin) and Valentin Bertsch (Ruhr-Universität Bochum). [Download](#)

<https://www.scientificamerican.com/article/solar-and-wind-power-could-ignite-a-hydrogen-energy-comeback/>

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Review:

<https://gasforclimate2050.eu/publications/>

<https://energyindustryreview.com/renewables/worlds-first-offshore-green-hydrogen-project/>

Hydrogen projects in Ireland 2020:

Government bodies such as “Enterprise Ireland” & “SEAI” have supported some of small hydrogen projects in Dublin City University over the years. But recently a number of large EU funded projects have been successful on the Island. These include;

NortherIreland Hydrogen Transport- Aims to install 1 hydrogen fuelling station and provide 3 hydrogen buses. <https://ee.ricardo.com/htpgrants>

GenComm – Aims to address the energy sustainability challenges of North West Europe communities, by commercially validating renewable hydrogen technologies. <http://www.nweurope.eu/projects/project-search/gencomm-generating-energy-secure-communities/>

SeaFuel – Aims to use the renewable resources and hydrogen across the Atlantic Area to power local transport fleet and support the shift towards a low-carbon economy <http://www.seafuel.eu/>

HUGE – Aims to address the necessity for assessing the hydrogen renewable energy chain from production through storage, transport and on to the end-user in the Northern Periphery and Arctic region. <https://actionrenewables.co.uk/news-events/post.php?s=new-eu-project-huge-to-launch-next-month>

HyLantic – Aims to establish a network to advance renewable hydrogen generation, storage, utilisation and implementation in the Atlantic area.

<http://hylantic.com/>

Separately a number of industry community groupings have focused on Hydrogen, these include;

Hydrogen Ireland Association - Aiming to achieve the establishment of a hydrogen economy on the island, through management of renewable energy and its utilization in zero emissions transport and grid injected to assist the decarbonisation of electricity and heating. <http://hydrogenireland.org/>

<https://www.h2-view.com/story/hydrogen-ireland-association-hoping-to-create-hydrogen-economy-for-ireland/>

Hydrogen Mobility Ireland – Aiming to deploy the first hydrogen fuelling stations, hydrogen supply chain and hydrogen fuelled public busses and cars in Ireland by 2023. <https://www.rte.ie/news/business/2019/0606/1053809-new-group-addresses-hydrogen-transport-in-ireland/>

Valentia - Aims to address the energy sustainability and economic challenges of island communities, utilising renewable hydrogen. <https://www.irishexaminer.com/breakingnews/ireland/valentia-aims-to-lead-way-in-hydrogen-energy-use-919902.html>