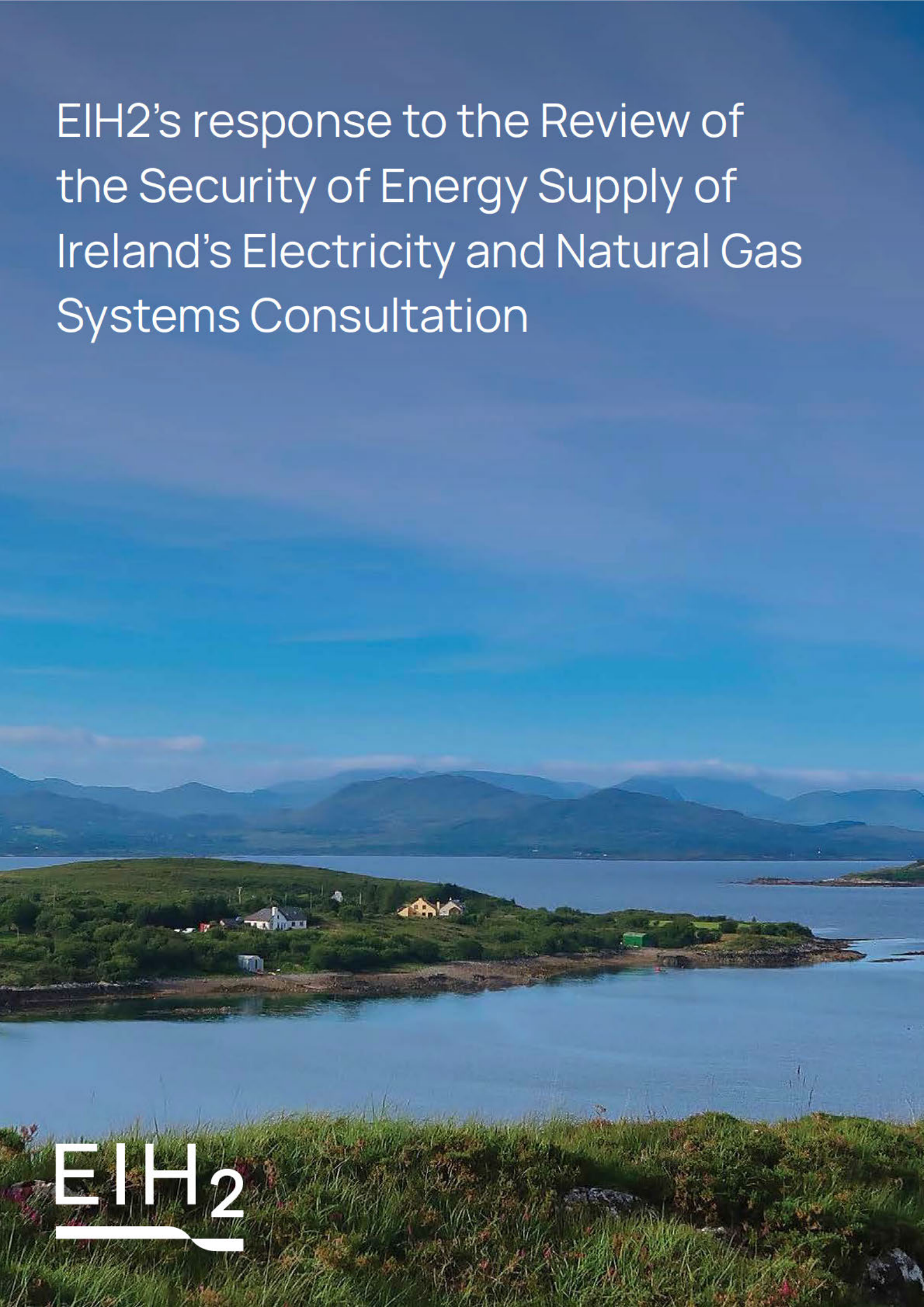
EIH2's response to the Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems Consultation



EIH2

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Executive Summary

EIH2 is Ireland's first green hydrogen production company, established to enable Ireland's green independent energy future. Green Hydrogen is produced when the energy from wind is converted to electricity, and that electricity is used to separate water (H_2O) into hydrogen (H) from oxygen (O). Our projects will produce green hydrogen from renewable electricity produced onshore and offshore. We welcome this opportunity to contribute to the Review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems Consultation.

Ireland's green independent energy future requires a 2050 focus and energy system integration.

To achieve an affordable, secure, and sustainable energy system by 2050, we must keep the end goal, the timeline, and the complexity of energy systems at the heart of all policies, including the Review of the Security of Energy Supply. While this review is focused on the period to 2030, it is in the context of ensuring a sustainable transition up to 2050. Even a perfect electricity system, with all its inherent costs, battery parks and overhead wires can never meet all our energy needs. We need to replace the fossil fuels which today enable non electrifiable end uses (HGVs, shipping); large volume and long duration energy storage to back up renewable electricity and transporting energy long distances.

We need an energy system where renewable electricity and renewable fuels are working in partnership. If we have more wind powered electricity than we need, we could store it as hydrogen. At times of low wind, we can use hydrogen powered thermal generation. Even that does not capture the whole picture. Green hydrogen enables green fertilizer production enabling food security, feedstocks for chemicals and a carbon free way to make cement for home building.

Ireland has more energy (in the form of wind) that we need on the island of Ireland (in the form of electricity). Attracting the large energy companies to Ireland to build out the offshore wind farms requires the economic carrot of the amount of energy that is there , not the domestic need. There is no net zero 2050 energy system without green hydrogen. Therefore, the short-, medium- and long-term actions for green hydrogen must be progressed and resourced to embed and enable the action for electricity and gas security.

Additional Risks & Mitigations

While it is completely correct to progress a standalone review of the Security of Energy Supply of Ireland's Electricity and Natural Gas Systems, a serious risk arises if the resultant actions are progressed outside the context of Ireland's energy transition to Net Zero 2050 as well as the affordability of energy at a domestic, industrial and national level. To avoid this, consideration should be given to

- Translating energy security policy into short-, medium-, and long-term actions in the 2022 Climate Action Plan and next National Energy and Climate Plan, including a national approach to informing stakeholders and citizens about energy system integration. This will help avoid silo-ed thinking around energy systems.
- Having one government department with responsibility for both the gas network operator (GNI is currently part of DHLG) and electricity network (Eirgrid is part of DECC)
- Ensuring Ireland's energy system and policy are in line with European policy to ensure compliance and access to funding
- Supporting Ireland's green hydrogen supply chain and activities that promote energy system integration.

Prioritisation of proposed mitigation measures

1. The **Gas Mitigation Package** should be implemented as it takes a holistic approach to the wider energy that we have in Ireland. Rather than consider a strategic gas storage facility in isolation, it looks at the economic opportunity that renewable gas and green hydrogen present. Progressing the role of these energy vectors will address hard to decarbonise sectors as well as using the existing infrastructure that citizens have invested in.
2. **Conversion of a gas fired power plant to hydrogen** should be implemented. The ability to provide a zero carbon back up for intermittent renewable energy sources will be key to the provision of energy security of electricity supply in a way that moves us closer towards our end game of a zero-carbon electricity system.

Enabling green hydrogen supply chain is a key lever to action to enable energy security in Ireland

Supporting the green hydrogen supply chain now will result in a phased approach to integrate hydrogen into Ireland's energy system. That supports security to both our gas supply and electricity supply. It means we can attract large energy FDI which means we have quicker access to larger amounts of renewable energy. We will have a backup for renewable electricity and the employment in the energy sector will grant the social licence needed for energy transition infrastructure. We will have an indigenous supply of energy that can be stored and transported meaning no dependence on imported energy.

[redacted] [redacted]

Responses

1. Risks

1.1 Are there any other security of supply risks that you can identify in addition to those set out in section 6?

Whilst the supply risks have been suitably identified, additional **risks are created when aspects of the energy transition are considered in isolation**. To achieve an affordable, secure, and sustainable energy system by 2050 with short- and medium-term actions, we must keep the end goal, the timeline, and the complexity of energy systems at the heart of all policies including the Climate Action Plan which has identified the need to progress and resource green hydrogen in parallel with renewable electricity targets.

If the creation of Ireland's green hydrogen supply is delayed or under-resourced, **we could miss the opportunity that green hydrogen provides to meet the increased renewables ambition announced**[1] and supporting Ireland and Europe's energy security.
Hydrogen should be viewed as a medium to long-term solution for energy security in Ireland.

To achieve this, the development and support for a hydrogen industry must begin now. Hydrogen can support the electricity sector, providing long-term and large-scale storage. The storage potential of hydrogen is particularly beneficial for power grids as it allows for renewable energy to be kept not only in large quantities, but also for long periods of time.

This means that hydrogen can help improve the flexibility of energy systems by balancing out supply and demand when there is either too much or not enough power being generated, helping to boost energy efficiency throughout Ireland and Europe[2].

Ensuring hydrogen is considered when addressing the complex issue of security of energy supply, enables Ireland **to capitalise on our own renewable energy**.

While renewables give us clean and sustainable electrical energy, there is a risk when intermittency occurs, and it is difficult and expensive to manage. Therefore, this **risk of insufficient buffering or storage capacity can be addressed by green hydrogen.**

[1] https://windenergyireland.com/latest-news/6895-wind-energy-industry-welcomes-increased-offshore-ambition
[2] https://energy.ec.europa.eu/topics/energy-systems-integration/hydrogen_en

1.2 If there are other risks that you have identified, could you outline some mitigation options to address the risk(s)?

Consider Ireland's security of energy supply within the context of the international and European energy system and policy frameworks

The European Union desire to fund integrated energy systems enabled by Green Hydrogen was seen most recently in the REPowerEU[3] plan. To access this funding, Ireland's actions must dovetail with the European approach. It also means we are on a path to comply with EU energy policy and regulation. Ireland can meet our domestic electricity and hydrogen needs with renewable energy to spare. Therefore, we must consider Ireland within the context of the international energy system to enable Ireland to become a net exporter of energy.

Ireland, however, should advocate for additionality conditions to be considered in the framework of geographic diversity, capacities, national targets and resources of each of its member states as this would empower countries like Ireland to export hydrogen to EU Member States who are already forecasting shortfalls between their indigenous hydrogen production capacity.

Exporting green hydrogen enables Ireland to play a key role in changing the risk to geopolitical stability by creating a renewable source of European energy.

Supporting Ireland's Green Hydrogen Supply Chain

For Ireland's energy system to be sustainable, affordable, and secure by 2050, the green hydrogen supply chain must be supported today in a similar approach to that taken for the wind industry and key actions should be created to prioritise the move from fossil fuels to hydrogen for non-electrifiable needs, create policy and regulatory framework for green hydrogen based on robust safety standards and build an understanding of integrated energy systems.

The additional workload created could be met by additional resources for the departments and agencies involved coupled with a collaborative approach between previously silo-ed parts of the energy sector.

Moreover, by incorporating green hydrogen into the larger renewable sector, we increase the employment of people involved in this industry and consequently, its social acceptance.
We in EIH2 look forward to supporting the next steps of the energy transition.

Creation of hydrogen valleys

Supports for renewable electricity, including the announcement of 2GW of offshore wind to be ringfenced for electrolysis all benefit hydrogen production. This could be further supported through the creation of Irish Hydrogen Valleys – a cluster of research, production and industry enabled by EU funding and public-private financing. A nuanced approach to the development of private hydrogen pipelines and electrical infrastructure will also support hydrogen

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483

production. Such market signals will encourage foreign direct investment by large energy companies as well as supporting the indigenous renewable energy supply chain.

Green hydrogen to address the risk of insufficient buffering or storage capacity

As stated in the previous question, renewable electricity faces an insufficient buffering or storage capacity, an issue that can be addressed by green hydrogen produced through electrolysis and in the case of Ireland, green hydrogen is an indigenous sustainable alternative.

If we inject the electricity immediately into the grid, we may encounter situations with either too much electricity, which blows the whole network, or we rely too much on renewables and suddenly we do not have enough electricity and as EIRGRID's 2021 Annual Innovation Report[4] indicates, this would also cripple the network unless there is a buffer or storage allowing excess electrical energy to be absorbed or re-injected into the network when supply is limited.

Therefore, green hydrogen represents a possible overall solution for long-term, carbon-free seasonal storage. Green hydrogen would absorb electricity in surplus situations. And then later, once hydrogen has been made, it can be used as a clean transport fuel, convert it back to electricity using fuel cell technology or inject it into the natural gas grid.

Furthermore, hydrogen stored in the form of pressurised gaseous, liquified or liquified ammonia can play a role in the security of supply for Ireland.
Hydrogen can be transported long distances when liquified or converted to green ammonia. In these forms, hydrogen can be stored in large reserves, securing Ireland's energy supply by offsetting imported fossil fuels.

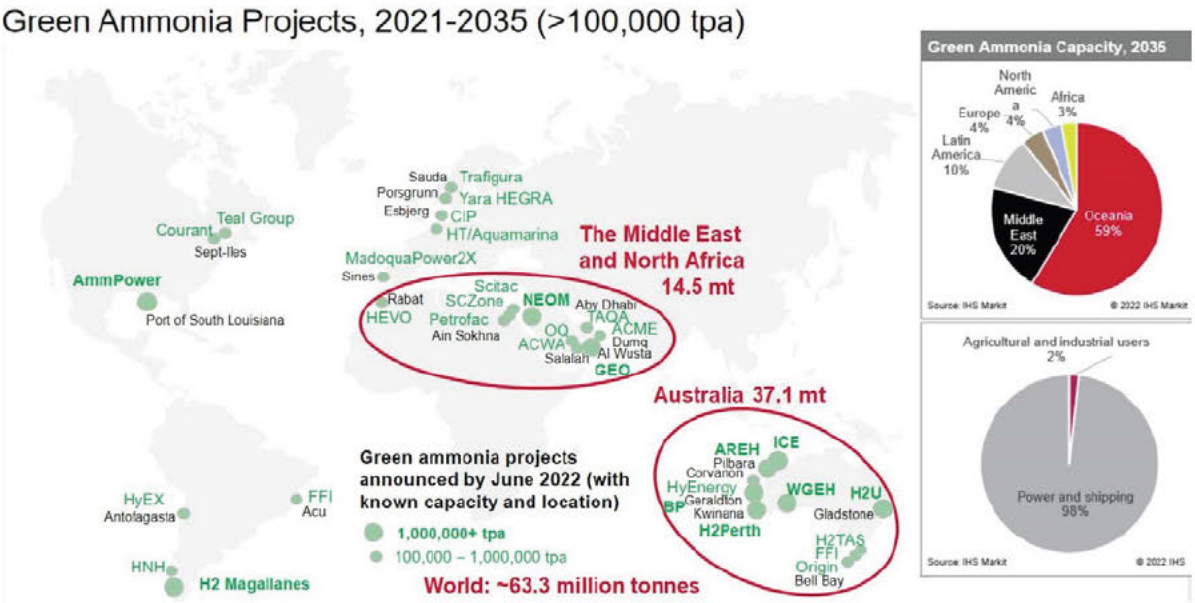

Figure 1 Proposed Green Ammonia Projects

[4] https://www.eirgridgroup.com/about/innovation-and-research/2021-Innovation-Report.pdf

Figure 1 Proposed Green Ammonia Projects - IHI Markit[5] shows that green ammonia could be imported as a fossil fuel alternative or as a lower carbon alternative to LNG in the long term. LNG is being considered as a short-term solution to the energy crisis for many EU states[6], green ammonia imports from a wide variety of locations could act as a low carbon solution to securing Ireland's Energy supply in place of importing LNG. The adoption of Green Ammonia in place of LNG would require a longer timeframe but would be a renewable alternative. Green ammonia adoption would require the install of direct combustion technology for large energy users or development of higher efficiency cracking technology, leading to a longer timeframe.

Hydrogen can be imported from multiple sources in the form of liquid hydrogen or ammonia, allowing Ireland to diversify and secure energy supply. Given the longer timeframes for end user technology development and more efficient ammonia cracking, domestic green hydrogen should be the primary focus for securing Ireland's energy supply.

Creating international markets for Ireland

An international focus with an export ambition encourages large international energy companies to develop projects in Ireland as they value economy of scale. The export option gives a route to market in proportion to the scale of the available wind, not the scale of the domestic need. This export focus will foster international trade agreements between Ireland and net hydrogen importers like Germany and Belgium.

Exporting green hydrogen in comparison to the direct export of renewable electricity through electricity HVDC interconnections would be **more efficient due to green hydrogen's versatility[7].** Technologies already available today enable hydrogen to produce, store, move and use energy in different ways for multiple purposes. Moreover, the ability to store electricity using green hydrogen could make wind and solar power a secure energy source, freeing Europe from its dependency on imported fossil fuels.[8]

Wind and solar energy aren't always available for electricity production and today thermal generation (burning fossil fuels) provides the back up and balance to these intermittent renewables. Green hydrogen will provide a zero-carbon replacement for this fossil fuel use. It will not be possible to use all our wind resources if we rely on electrical infrastructure alone. We need Green Hydrogen so we can store and transport energy around Ireland and Europe.

[5] https://cleanenergynews.ihsmarkit.com/research-analysis/european-green-ammonia-is-profitable-now-and-will-be-again-aft.html
[6] https://www.reuters.com/business/energy/us-eu-strike-lng-deal-europe-seeks-cut-russian-gas-2022-03-25/
[7] https://iea.blob.core.windows.net/assets/9e3a3493-b9a6-4b7d-b499-7ca48e357561/The_Future_of_Hydrogen.pdf
[8] https://ec.europa.eu/research-and-innovation/en/horizon-magazine/hydrogen-could-help-secure-europes-energy-supply-bert-de-colvenaer

2. Mitigation Options

2.1 Do you have any additional mitigation options that you think should be considered?

Giving green hydrogen high priority in the Climate Action Plan and adding specific actions for the development of an Irish Green Hydrogen Supply Chain will immediately mitigate risks and address the complexity of ensuring security of energy supply.

More details have been provided throughout the answers in previous section.

2.2 Which gas supply mitigation options, if any, should be considered for implementation?

The **Gas Mitigation Package** should progress considering renewable gas and green hydrogen production.

The consultation document states that "on an individual basis they would not be able to mitigate against a significant supply shock given their current and expected scalability by 2030". While the end goal is 100% green hydrogen pipelines, this could be accelerated by an interim step of hydrogen blends injected into the gas network as this mitigation option suggests.

The risks of this action have been mitigated since 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 as a near 100% hydrogen. Blending is an effective use of this 2.7Bn asset that Irish citizens own. Secondly, the ultimate solution for the European Hydrogen Backbone is to re-purpose some of the existing gas network[9]. Thirdly, GNI are preparing to accept a blend of hydrogen into the network from the UK by 2025.

In addition, the Gas Mitigation Package option combined with a strategic storage facility provide a viable mitigation option and create demand for hydrogen in Ireland so that we can build up a supply chain here. Therefore, blending may be a solution that is not ideal from a sustainability viewpoint in the short term but could enable larger sustainability gains over time.

To address the sustainability issue and make it a long-term solution, the European Hydrogen Backbone (EHB)[10] initiative is promising as in order to deliver the 2030 hydrogen demand targets set by the RePowerEU plan, five large-scale pipeline corridors are envisaged and are included in the EHB's most recent report "Five hydrogen supply corridors for Europe in 2030"[11]. The corridors will initially connect local supply and demand in different parts of

[9] https://ehb.eu/page/european-hydrogen-backbone-maps
[10] https://ehb.eu/
[11] https://ehb.eu/files/downloads/EHB-Supply-corridors-presentation-ExecSum.pdf

Europe, before expanding and connecting Europe with neighbouring regions with export potential. The planned hydrogen backbone network will largely be based on repurposing existing natural gas infrastructure. Therefore, Gas Networks Ireland is a key participant in Corridor C. Corridor C would meet demand from industrial clusters and ports in the UK, the Netherlands, Belgium and Germany enabling European partnerships that include Ireland. For this purpose, collaborative research has begun between Gas Networks Ireland and University College Dublin's (UCD's) Energy Institute to ensure the safety and operability of Irish Gas Network when transporting a blend of hydrogen and methane.

Moreover, the **Onshore Energy Storage Project** should also progress its implementation. However, the facility design should be conditioned to be hydrogen ready.

2.3 Which electricity supply mitigation options, if any, should be considered for implementation?

The **conversion of an existing CCGT to hydrogen** should also be a priority and consideration must be granted to the fact that two biggest manufacturers of generation equipment are offering blended and 100% hydrogen fuelled gas turbines. While the cost of electricity delivered through this method is high, a study by the FCH JU[12] assumed that Ireland will be one of the early adopters of hydrogen power generation.

2.4 What measures should be considered on the demand side to support security of supply of electricity and gas?

Ireland will improve energy efficiency including retrofits; create as much renewable electricity as possible and strengthen the grid. There will be increased electrification for heat pumps and personal vehicles. That transition will still come with its own challenges and while people continue to switch to heat pumps and the EV uptake increases, so will the demand for electricity.

Therefore, green hydrogen as an energy vector offers an additional solution for such cases. For example, in the case of industrial heating, hydrogen can be used to produce high heat in industrial applications. This provides a decarbonisation solution for industries where grid capacity is limited, and these industries can't get the electricity they need for electrode boilers. It also gives Ireland another option rather that adding all industrial heating load to the electricity grid and the necessary grid upgrades.

As for mobility, Hydrogen Fuel Cell Vehicles offer similar refuelling practices to diesel and have similar range and performance and are suitable for larger vehicles such as heavy good vehicles.

Hydrogen should be also considered on the demand side for onsite electricity generation. The consultation document adds the "Significant increased demand from LEUs" as a Demand Side

[12] FCHJU | Opportunities for Hydrogen Energy Technologies Considering the National Energy & Climate Plans https://www.fch.europa.eu/sites/default/files/file_attach/Brochure%20FCH%20Ireland%20%28ID%209473093%29.pdf

Risk and mentions data centres to be expected the main driver of the projected rise in overall electricity demand. Indeed, data centres and additional LEUs have a large constant load profile and as a result take up a substantial proportion of Ireland's energy requirement. This has resulted in policy whereby data centres will need to have their own onsite flexible generation. Conventionally, data centres would have used gas fired turbines, but this would sacrifice their ambitious climate goals. Therefore, green hydrogen power generation is a solution that Data Centres are investigating, and OEM's have created solutions to fulfil this demand. Results show that hydrogen powered electricity generation means data centres and other large energy users can have a reliable energy supply. In fact, the Department of Environment, Climate and Communications require such onsite generation in order to receive firm grid capacity. Li-ion batteries are only suitable for short duration, and they have high costs and high space requirements. Fuel cells, on the other hand, deliver grid-scale power in a smaller footprint and are recyclable/refurbishable.

The broader consideration of hydrogen into energy security mitigation options not only benefits to already established LEU but it will send a clear market signal and attract investment from large energy companies, meaning a financial risk sharing between the public and private funding sources.

Furthermore, in the context of energy, spatial planning processes of social, economic and environmental change aim to help Ireland achieve its 2050 decarbonisation targets. Spatial planning needs to address the complex issues of the spatial relationship between employment locations, industry locations, safety, and end user locations. As such, hydrogen production should be considered for the following areas:

- Areas where significant renewable energy resources, such as on-shore and off-shore wind exist, but there is a lack of electrical grid capacity, most notably the south and west coast of Ireland, thus ensuring an alternative method of evacuating energy.
- Areas where hydrogen can be easily deployed to off-takers, via pressurised tube trailers.
- Areas conducive to the injection of hydrogen into the national gas grid.
- Areas conducive to export, such as ports. Deep water ports will also be instrumental in enabling the export of green hydrogen to EU.
- Areas around which hydrogen valleys could be established.

Ports will play a major role in the large-scale role of hydrogen production facilities powered by offshore wind. The ports will be required for the construction and O&M of the offshore wind facilities. Such as the plans currently being developed by Shannon Foyne's Port Company[13] and Port of Cork[14]. Both are planning on establishing offshore wind hubs, including manufacturing bases for floating offshore wind turbine foundations, wind turbine component assembly and operation and maintenance bases. They also include large scale onshore

[13] https://www.sfpc.ie/offshore-wind/
[14] https://www.corkchamber.ie/wp-content/uploads/2022/02/Cork-Harbour-2025-Ready-to-Float-Offshore-Wind.pdf

hydrogen production facilities for the conversion of electricity produced from offshore wind to green hydrogen for domestic and international use.

In addition, these locations give Ireland an opportunity to join international cooperation initiatives such as the Global Ports Hydrogen Coalition[15], which is the first global forum that brings representatives from ports together with decision-makers from governments as well as industry with the view to accelerate low-carbon hydrogen deployment. Ports such as the Port of Vienna, Port of Amsterdam, Port of London and Port of Gothenburg, all participate in this engagement dedicated to support the scale-up of clean hydrogen in the global economy.

Finally, EIH2 highly encourages to consider hydrogen for storage and security of supply. Hydrogen is the optimum medium for clean energy storage. If stored in its gaseous form or as metal hydrides, hydrogen can be stored without losing any of the energy stored within (1kg of hydrogen will always contain 33.3 kWh of energy), regardless of the storage duration. Whilst battery storage is proven inefficient over long periods of time.

Hydrogen is uniquely positioned to play a critical role in the decarbonisation of high-grade heat demand, gas demand and other hard to abate processes across Ireland. Storage of hydrogen is required to ensure a consistent baseload to these consumers, when there are no renewables supplying power to hydrogen generation plants. If this problem is not solved, then Ireland will constantly have to resort to imported fossil fuels during times of low penetration of wind or solar power to the grid.

The level of hydrogen storage required is dependent upon the duration where there is no renewables to generate more hydrogen. For example, if Ireland has a hydrogen demand of 5GW, and there are 20 days of no or low wind in a year, then enough storage should be installed to cover this 20-day period.

In addition to this, storage should be considered for the following:

- 90+ days storage as National Fuel Reserves
- Storage to allow consistent levels of export of hydrogen (or hydrogen carriers) to the Europe Market

2.5 Do you have any views on how the mitigation options should be implemented?

Mitigation options should be included in the Climate Action Plan and held accountable for their implementation. This avoids silo-ed thinking where actions could be perfect for one aspect of the energy system but could result in unintended consequences for the other aspects.

Thus, EIH2 would like to emphasise the parallel work between electrification and hydrogen that we have been proposing. EIH2 strongly state that green hydrogen will not compete with direct electrification as electrification will be and should be applied in industries where it is the most sustainable and efficient solution. However, electrification should not take us from developing green hydrogen production as Ireland requires a parallel solution for industries

[15] https://sustainableworldports.org/global-ports-hydrogen-coalition/?fuel=hydrogen

that are hard to decarbonise and where green hydrogen could play a key role as it has been exhibited throughout this submission and the EIH2's Submission to the Hydrogen Strategy Consultation[16].

In addition, **mitigation options should encourage synergies between industries in clusters, ports and cities create a virtuous circle between supply and demand**. Costs are reduced through shared infrastructure and encourages more demand within the same area. This demand then enables the production to expand, further reducing costs and enabling even greater use.

The announcement and establishment of "go to zones" in line with REPowerEU will play a critical role in creating a more efficient planning process for renewable energies such as hydrogen. Appropriate land zoning for the production of hydrogen will greatly accelerate the growth of the hydrogen economy and government could further incentivise industries to set up near hydrogen production facilities. This supply chain localisation will not only reduce emissions associated with the transportation of hydrogen but also reduce the cost of hydrogen for consumers[17].

Appropriate zoning of hydrogen production can also benefit the governments objectives under The Rural Development Plan 2021. Hydrogen production facilities create employment and revenue for rural areas around the country, but the establishment of hydrogen valleys and clusters will also act as a significant mechanism for attracting foreign direct investment[18]. Socio-economic analysis has found that creating industry zoning policies can be an effective tool to stimulate economic growth through a process of shared resourcing. An example of other industry clusters policies that was deemed to be successful by both academics and policy makers was in South Korea in 1960, the decision to zone land by industry clusters led to the fastest economic growth in modern history. South Koreas GDP per capita grew from $100 in 1963 to $10,000 in 1995[19].

Synergy across multiple sectors will also allow for the easier monitoring and auditing of hydrogen safety standards, reducing the workload for the designated regulatory body responsible for the distribution of GoO certifications.

[16] https://eih2.ie/wp-content/uploads/2022/09/EIH2-Hydrogen-Strategy-Consultation-2022.pdf
[17] https://www.sciencedirect.com/science/article/pii/S0360319921032444?casa_token=uccFiAA0Yk8AAAAA:iracRcA6r_GwUHYh3a1OJvfhMTYNdh7bz9CmwMacxjHFZ9TBI1ho7z_Uo6qQeFMo5jVNyFzz-eo
[18] https://www.mdpi.com/2071-1050/12/24/10560
[19] https://www.researchgate.net/publication/343693497_Development_of_Industry_Linking_Cluster_in_Vietnam

3. Policy Measures

3.1 Do you support the policy measures proposed in section 8 of the consultation paper?

Joint planning between EirGrid and GNI and regular energy security reviews will enable policy updates. To achieve this, consideration could be given to moving GNI from the Department of Housing, Local Government and Heritage to the Department of Environment, Climate and Communications.

However, as added in the mitigation options, conceding high priority to green hydrogen in Ireland's Climate Action Plan and adding specific actions for its industry development will immediately mitigate risks and relax the complexity of ensuring security of energy supply.

IRENA states that countries with an abundance of renewables could become producers of green hydrogen, with commensurate geoeconomic and geopolitical consequences and supporting the advancement of renewable energy and green hydrogen in developing countries is critical for decarbonising the energy system and can contribute to global equity and stability[20]. Therefore, adding green hydrogen projects to Ireland's Climate Action Plan enables Ireland to play a key role in changing the risk to geopolitical stability by creating a renewable source of European energy. This works coherently with the policy measure on International Arrangements as it build on existing arrangements in the event of supply shocks.

3.2 What further tools and measures do you think would contribute the most to Ireland's energy security of supply?

The Government should continue to address the difficulties faced by the wider wind industry such as developing grid infrastructure, addressing planning delays and resourcing government departments to progress the renewable energy sector.

Furthermore, EIH2, as a green hydrogen company, takes this opportunity to emphasise the role of green hydrogen in supporting Ireland's energy security and therefore, make further recommendations on tools and measures that would support Ireland's hydrogen industry and consequently, Ireland's energy security of supply.

A phased approach to integrate hydrogen into the energy system

In long-term energy strategies, governments should determine the most efficient way hydrogen can be used to support decarbonisation efforts and hydrogen policies don't follow a 'one-size fits all' model. However, what Ireland can learn from other countries is that policies have been set to send long-term signals and boost stakeholder confidence in the development of a marketplace for hydrogen and related technologies. Integrated actions can

[20] https://www.irena.org/publications/2022/Jan/Geopolitics-of-the-Energy-Transformation-Hydrogen#:~:text=Countries%20with%20an%20abundance%20of,and%20develop%20new%20export%20industries.

guide future expectations, unlock investments, and facilitate co-operation among companies and countries.

MaREI's report Our Climate Neutral Future Zero by 50[21] recognises that in 2050 Ireland's energy mix will look very different from today, pointing out that 'wind will provide two-thirds of Ireland's total energy needs, either directly through the electricity supply, or by generating large amounts of hydrogen for heating, transport or to be stored for use in power plants'.

Therefore, considering the scale of renewables and hydrogen needed to achieve a future net zero energy system, and establishing sectoral targets and short, medium and long-term goals on green hydrogen will help to overcome this issue.

Consider green hydrogen for sectors without alternative options for decarbonisation

In an Irish context, it has been stated that the demand of green hydrogen must be created in order to de-risk investment by hydrogen producers and the introduction of targets for end-users such as heavy transport is encouraged taking by example the Netherlands, Portugal, and Hungary who have successfully set them up for 2030.

However, transport is not the only hard-to-decarbonise industry and decarbonising the direct use of fossil fuels in heating and industry, which together with transport make up 80% of Ireland's energy use has been very challenging.[22] Therefore, considering Ireland's world-class wind and ocean energy resources, green Hydrogen presents an opportunity for these sectors where developing a hierarchy of use of renewable hydrogen, based on identification of high value and efficient applications and by focusing on sectors without alternative options for decarbonisation would support the demand of hydrogen in a sustainable way.

Consider green hydrogen to be incentivised in the electricity market

The decarbonisation of Ireland's electricity system has been one of Ireland's great success stories. Emissions from electricity generation in Ireland fell by 51.4% from 2001 to 2020[23]. This sizeable drop reflects improvements in the energy efficiency of modern gas-fired power plants as well as the increased share of renewables in the electricity system.

The government has set ambitious targets for the ongoing roll-out of renewable energy generating capacity, including seven gigawatts of offshore wind by 2030. EirGrid, as the transmission system operator, instructs a renewable electricity generator to produce less electricity than it can or even to shut down entirely.

Figures show in the Annual Renewable Energy Constraint and Curtailment Report 2021[24] that 7% of wind generation was lost because wind farms were told to stop generating.

Therefore, the government should ensure long-term goals to increase renewable electricity capacity and power infrastructure also support the growth of the hydrogen economy. Many jurisdictions are in the process of defining how to consider hydrogen production from

[21] https://www.marei.ie/our-climate-neutral-future-zeroby50/
[22] https://www.energyireland.ie/the-path-to-net-zero-heating-and-cooling-in-ireland/
[23] https://crni.ie/content/uploads/2021/11/Irelands-Provisional-Greenhouse-Gas-Emissions-report-1990-2020_final.pdf
[24] https://www.eirgridgroup.com/site-files/library/EirGrid/Annual-Renewable-Constraint-and-Curtailment-Report-2021-V1.0.pdf

electrolysers connected to the grid as renewable, meaning they are linked (directly or virtually) to (sometimes additional) renewable electricity capacity. While this principle of additionality helps in achieving a needed increase in renewable capacity, it may require some flexibility in terms of temporal correlation because electrolyser use is a key factor in decreasing the cost of renewable hydrogen in the short term. Instruments like power purchase/supply agreements or any credible green supply agreement help maximize options and create a competitive environment for renewable hydrogen.

Support hydrogen-based enterprises

Large energy users require certainty and support if they are to transition from fossil fuel use to hydrogen use instead. Access to Green Hydrogen will ensure companies continue to grow their operations in Ireland as well as attracting new foreign direct investment with a sustainability agenda. It could also attract new industries to Ireland that rely on availability of green hydrogen, such as renewable fertiliser production, thus increasing food security and reducing emissions from agriculture.

Support the development of green hydrogen exports

In this context, Ireland needs to act boldly and develop the right policies and regulations to support the domestic hydrogen market, define the governance and institutional framework, and develop the funding model in parallel to build the export infrastructure and secure supply agreements with key export markets.

When looking at Hydrogen Europe's [25] report on other member states' national hydrogen strategies, policy and legislative measures included are:

- Fiscal incentives: exemption of surcharges; public – private partnerships; tax exemptions; direct funding.
- Standards: European and International support; infrastructure; refuelling stations; end-use.
- Support for Research and Development: entire hydrogen value-chain; skills and competences for the hydrogen future.
- Administration: removal of administrative barriers; simplification of procedures for hydrogen; civil servants' preparation.
- Guarantees of Origin: International and European; green hydrogen; carbon footprint.

Therefore, a similar approach and supports should be taken into consideration to develop and support a hydrogen economy for Ireland that would consequently support Ireland's energy security of energy supply.

Enable cross-border partnerships

As countries build partnerships to import and export green hydrogen, Ireland must show that we can deliver to realise this opportunity and follow the model of potential partners like Germany who are setting hydrogen diplomacy offices to increase dialogue with strategic partner countries, covering areas such as the development of the international hydrogen market and ways to enhance cooperation in order to harness the opportunities that this

[25] Hydrogen Europe - National Hydrogen Strategies Tracker & Analysis. 27.07.2022

market creates. Because promoting hydrogen and its downstream products also generates competitive advantages, the offices are therefore tasked with providing expertise as well as analyses of the local and regional impact of the transformation. Another key part of their role is to build ties between decision-makers, experts, and companies from two or more countries[26] and the signing of formal commitments.

[26] https://www.auswaertiges-amt.de/en/aussenpolitik/themen/hydrogen-diplomacy-office/2513802