

DECC Electricity Interconnection Policy Consultation Response

2 September 2022



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About SuperNode and Superconductors

SuperNode, headquartered in Dublin, Ireland, is a global technology development company that designs and delivers cutting-edge, superconducting cable systems for bulk electricity transmission.

Conventional transmission cables are limited in terms of current levels which in turn limit their power transfer capability. Networks based upon superconducting cable systems can move larger quantities of power over longer distances with smaller and less obtrusive infrastructure, without electrical losses and at significantly lower voltages. SuperNode's technology will connect electricity markets in a way that facilitates the integration of large-scale renewables and the achievement of a decarbonised pan-European energy system.

SuperNode was founded in 2018 by [REDACTED] and renewable energy developer Mainstream Renewable Power Ltd. SuperNode is jointly owned by [REDACTED] and Norwegian green investment group AKER Horizons.

1. SuperNode Comments

SuperNode Ltd. (SNL) would like to thank the Department of Environment, Climate and Communications (DECC) for the opportunity to provide its comments to the *Electricity Interconnection Policy – Technical Consultation*, published on 10 June 2022.

SuperNode, headquartered in Dublin, Ireland, is a global technology development company that designs and delivers cutting-edge, superconducting cable systems for bulk electricity transmission. SuperNode's technology will connect electricity markets in a way that facilitates the integration of large-scale renewables, the achievement of a decarbonised pan-European energy system and cost-effective cross-border exchange of electricity to enhance Irish security of supply.

In addition to this submission, SuperNode has contributed to, and supports, the comments made by Wind Energy Ireland (WEI) in its response to this consultation.

In addition to the points made by Wind Energy Ireland in its submission, SuperNode would like to make the following observations in the context of a much needed revision of Ireland's interconnection policies:

- EirGrid's Shaping our Electricity Future (SOEF) will not be sufficient to enable Ireland to meet our 2030 targets, we need to go further to ensure we can reduce our carbon emissions by 51% by 2030. Ireland is still expected to emit over 70 million tonnes of carbon by the end of the decade, even if we achieve all of what has been set out in SOEF. Moreover, SOEF does not consider that 2030 is only a steppingstone on the path of decarbonisation of Ireland and the rest of the European Union. Ireland's 2030 targets must be considered an intermediate target on the path to decarbonisation, and as such, planning for infrastructure must look beyond 2030 and consider what is the optimal design of the electricity system for decarbonising the entire Irish energy system in the long run.
- Both from a security of supply and a climate perspective, we are currently paying the price for the incrementalism and short-sightedness of our energy interconnection policies. The development of anticipatory grid infrastructure must be made an integral principle for the future. This requires good early-stage planning and coordination at a higher level than on a provincial level, or even a national level. It will require funding that may not show benefit for the early projects on a project-by-project basis but on the basis that within the context of a wider pan-European plan gives the most economically advantageous outcome for 2050. To do this requires significant regulatory reform, domestically and in the EU, as most regulations are directed to minimise the cost to consumers within a 5-year price control horizon.
- Ireland has, together with the rest of the EU, committed to fully decarbonising its economy before 2050 and to cut its greenhouse gas emissions (GHG) by 55% before 2030 compared to 1990. 60% of Ireland's greenhouse gas emissions are related to energy production and consumption. Therefore, the energy sector must undergo fundamental change which will have a profound impact on all aspects of Irish economic development
- Throughout this transition, Ireland should maintain its status as Europe's fastest growing economy. Increasingly, that will entail meeting a rapidly growing demand for



the stable supply of electricity based on renewables to underpin economic growth and support the increased electrification of the heating and transport sectors of the economy. Large amounts of renewable electricity will also be needed for data centres and to produce the renewable hydrogen and hydrogen-based fuels needed to decarbonise hard-to-abate sectors such as the aviation and maritime industries. The same development will need to take place throughout Europe, which will increase demand for carbon-free electricity in Europe significantly.

- All EU countries, as well as the UK and Norway, must follow the same path as Ireland of decarbonising their economies through increased electrification based on renewable energy resources. These will mainly take the form of solar PV and wind energy, which are already undercutting fossil fuels on cost. Wind energy capacity alone must increase five-fold from 220 GW in 2020 to 1,200 GW for the EU to decarbonise, according to the European Commission. On average, 33 GW of wind power capacity must be installed annually over the next 30 years. Annual installations from 2016-2020 averaged less than 15 GW.
- Few, if any, European countries are as well endowed with renewable energy resources as Ireland. Its sea area is even times its land mass. Moreover, the average wind speeds in the Irish sea basin are the absolute highest in Europe, giving Ireland a distinct comparative advantage in offshore wind energy production. In 2020, wind energy covered 36.4% of Ireland's electricity demand. This was almost exclusively based on onshore wind. However, more than 12 pct. (1,900 GWh) of Ireland's (All-Island) wind power was wasted, through "dispatch-down" of wind energy in periods where the energy could not reach a consumer. In total, 42.5% of Ireland's electricity was produced by renewables last year. According to the Government's Climate Action Plan, a share of 80% can be reached in 2030. That would require a dramatic shift in pace in the development of offshore wind energy and require significant efforts to minimise even higher levels of "dispatch down".
- For Ireland to turn its comparative advantage in renewable electricity production into a competitive advantage in supplying Europe with affordable renewable electricity, mainly in the form of offshore wind, Ireland's electricity grid must be adapted to a future based on weather-dependent renewable energy technology with the following features:
 - a. It must ensure that consumers are protected against supply disruptions caused by a variable supply of electricity;
 - b. It must be strongly interconnected with the UK and the European continent, to reduce curtailment to a minimum, while enabling Irish wind power to flow to the areas in Europe where demand is greatest and power prices are highest.
- Three distinct characteristics of renewable energy require wide-area power exchange in Europe.
 - a. Most high-quality wind and solar resources are located far away from population centres;
 - b. Fluctuations in output from individual plants is a local or regional phenomena;

- c. Renewable generation can provide secure electricity when it is needed, when pooled across regions with different wind, solar and load patterns.
- We need a pan-European approach to decarbonisation. This means a coordinated approach to renewable development supported by a grid that can ensure security of supply for all countries based upon renewables. The planning and deployment of such an offshore Supergrid would require a new, European institutional setup in the form of an “Architect” that must ensure that efforts are efficiently deployed, that grid investments are efficiently undertaken, and that Europe’s renewable energy resources are extracted and supplied to consumers in the most cost-effective manner.

It would be in Ireland’s self-interest to spearhead and promote in the EU, - together with the UK and Norway - the idea of planning a pan-European renewable energy Supergrid that connects resource-rich areas, such as Ireland (offshore wind) or Spain (solar), to the main demand centres of central Europe that are less well endowed with renewable energy resources. It would protect Irish consumers against price spikes, supply disruptions and curtailment cost and enable it to reap the commercial benefits of supplying Europe with renewable electricity, in which it has a distinct competitive advantage, and commercialising new technology in offshore wind and grid technology.

- Designing tomorrow’s grid using today’s technology and an incremental approach will result in a grid that is not fit for purpose in addressing the challenge of decarbonising our economies based on two variable renewable resources – solar and wind. The government should ensure that Eirgrid facilitates and encourages innovation in grid technology and does not limit itself to a premature selection of technology. Licence conditions and incentives should be reviewed to encourage the adoption of new technologies to enable our renewable future.
- Current transmission grid technology is insufficient to move around the vast quantities of energy needed in Europe’s future, weather-based energy system. Therefore, innovative grid technology must be developed, tested and applied to minimise energy losses and the cost of developing the necessary pan-European meshed grid. Irish companies are currently developing transmission technology based on superconductors that can carry huge amounts of power, at no losses and with a much smaller footprint than conventional cables, requiring significantly less infrastructure, materials, space and cost. Such efforts to develop innovative grid technology, must be encouraged by national and EU research, innovation and demonstration programmes.
- The recent revisions to the TEN-E regulation are welcomed, including the designation of priority offshore grid corridors and the sea-basin approach to coordination of offshore renewables and grid infrastructure with neighbouring countries. This can ensure an adequate and reliable transmission grid and the ability to supply electricity generated offshore to landlocked Member States, providing a significant opportunity to end the isolation of Ireland through export and expanding our route to market. Ireland must ensure that the political agreements – due on 24 January 2023 - on offshore capacity for the two sea basins that we are part of (Northern Seas offshore grid (‘NSOG’) and Southwestern Europe offshore grid), reflect the 51% reduction

target by 2030 and a Net-Zero Irish electricity system by 2035 as well as a fully decarbonised economy by 2050.

- In SuperNode’s view, the EU’s 15% interconnection target by 2030 is far too low for an island with an ambition to be powered by variable renewable energy in the future. A number of EU countries have either already met or surpassed this target, e.g. Denmark’s interconnection level is above 50% already. A 30% interconnection target would recommend circa 4 GW of interconnection capacity in the near term. However, Ireland must already now start to plan for the interconnection that will support a decarbonise Irish economy based on increased electrification beyond 2030. Existing and proposed interconnectors from Ireland would give a total of circa 2.2 GW if and when all are operational. The proposed MARES Interconnector may add an additional 750 MW to this. However, this would still leave Ireland with a shortfall to reach 30% and that level would be far from enough to support a future Irish net-zero economy.
- Future interconnection should be planned from Ireland to both Great Britain (GB) and the EU and stress that the location of interconnection in Ireland will need to be carefully considered so as not to exacerbate existing network constraints on the system.
- Much of the existing Irish legislation relating to interconnection is appropriate. However, the policy legislative framework for requirements beyond point-to-point interconnection, such as to facilitate and enable hybrid interconnection, meshed offshore grids, as well as enabling the deployment of direct wire solutions in appropriate circumstances seems inadequate or plain missing – domestically and at EU level - and SuperNode would recommend that the legislative framework undergoes an evaluation to address these points.

2. Specifically on offshore

According to WindEurope’s flagship report “Getting fit for 55 and set for 2050”¹:

“wind resources in Europe have the potential to generate more than 33,000 TWh annually. This would be enough to meet Europe’s annual electricity demand ten times over. More than 8,000 TWh could be produced by onshore wind and more than 25,000 TWh from offshore wind. 60% of that would be accessible through floating solutions in waters deeper than 60m.”

Offshore wind is envisaged as being a vital part of Europe’s fight against climate change. The European Commission’s 1.5 TECH scenario requires more than 450 GW of offshore wind installed in European waters. Ireland also has ambitious plans for offshore wind, with a target of 5 GW set for 2030 – now set to increase to 7 GW following recent Government announcements on Sectoral Emissions Ceilings² - and the Programme for Government highlighting a potential for at least 30 GW of floating wind in the longer term.

¹ Getting fit for 55 and set for 2050; etipwind.eu and windeurope.org; June 2021.

²<https://www.gov.ie/en/press-release/dab6d-government-announces-sectoral-emissions-ceilings-setting-ireland-on-a-pathway-to-turn-the-tide-on-climate-change/>



Interconnection is a prerequisite for Ireland to decarbonise and become independent of fossil fuels.

According to the European Commission³, the investment needed for the large-scale deployment of offshore renewable energy technologies by 2050 is estimated at almost €800 billion. Circa two thirds will be needed to fund the associated grid infrastructure and one third for offshore power generation.

The offshore area does not have an electricity grid yet, and how these huge capacities of offshore wind connect into the energy system is a question now being asked, particularly as we identify levels of offshore potential beyond what individual national grids could accommodate alone.

The delivery of a pan-European offshore electricity network will be essential in enabling and accelerating Ireland and the EU's ability to incorporate offshore resources and meet 2050 climate targets.

Ireland has some of the highest average wind speeds in Europe averaging more than 12 m/s at 100m hub height on the west coast. For context, the Scottish North Sea is thought to have some of the best wind resources in Europe which have been developed to date, and average wind speeds there, at the same height, are between 9.5 – 10 m/s. Ireland's significant offshore resource exceeds national demand by several orders of magnitude.

Ireland has set an ambitious target of 80 per cent renewable electricity share by 2030, but the reality of rapidly increasing electricity demand highlights the challenges around the plans to meet the 2030 targets set. Moreover, we must start preparing for post-2030 now. The current Irish approach of incrementally changing the grid system to facilitate slowly increasing levels of renewables will not be sufficient as demand increases at a faster rate. Incrementalism does not always suffice. There is no incremental way to reach a Net-Zero electricity system by 2035 and a climate neutral European by 2050. Current grid planning is too slow to react to renewable targets.

This method of grid infrastructure development is not fit for purpose and will result in grid capacity remaining as one of the major roadblocks to delivering our renewable targets. Instead, grid planning should facilitate anticipatory investments, as proposed by the European Parliament in its resolution on a European strategy for offshore renewable energy⁴.

The case for developing a pan-European Supergrid is clear in the Irish context. Ireland is a small country with a sea area seven times larger than its land mass. Ireland has the unique opportunity to lead the development of an offshore grid that integrates a high level of offshore renewables and offers us the opportunity to export vast amounts of energy.

With regards to the specific questions asked in the consultation, SuperNode would like to refer to the answers provided by Wind Energy Ireland, which we fully support. The response can be downloaded from www.windenergyireland.com

³ EU strategy on offshore renewable energy (COM(2020)741), European Commission, 19 November 2020

⁴ European Parliament resolution of 16 February 2022 on a European strategy for offshore renewable energy (2021/2012(INI))

