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Overcoming Challenges in Delivering Offshore Wind Development for Ireland

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Executive Summary

The delivery of offshore renewable energy is key requirement and necessity in order met Ireland's commitments to deliver a decarbonised energy system (80% by 2030), but also presents an opportunity to the economy which will provide a positive benefit for the foreseeable future. In this study a number of areas were explored and there is a concern that Ireland will not meet its targets unless a positive government intervention is made and we build on a 'plan-led' approach, already implemented in some aspects of this exciting opportunity.

In Appendix 3 there are a number of articles that were written as part of this study, and published by the Irish Examiner, which address a number of the key issues that the study found. The target of 5GWs of ORE by 2030 seems unlikely to happen and a key part of that is the unavailability of ports in Ireland, the ability of Ireland to process the planning applications and deliver planning permission and the length of time it takes to deliver legislation such as the Planning and Development Act 2023, which at this time is still not passed by the Dail.

To summarise some of the key findings

- In the review of the Governments approach through its strategy and policy documents along with its implemented and pipeline of legislation, has taken many positive steps to clear the obstacles to a smooth implementation of offshore wind**. The setting of the Offshore Wind Delivery Taskforce (OWDT) as the kernel to the government approach, spanning all relevant departments is seen as a very positive approach.** Their ability to see through this work will be central to Ireland delivering on our commitments, and their progress will be monitored.
- One key concern, which is discussed with the document is while the port requirements is acknowledged as being required, the level of activity and the ability of these 'private' ports in Ireland to commit the financial resources to develop what is required is open to question. In the 2013 National Port Policy [1] the current port model is one of publicly controlled port authorities with high levels of private-sector involvement in the provision of infrastructure and services. It also states that that '**the ports sector should receive no further Exchequer funding for infrastructure development or otherwise will be maintained.'** This statement alone makes the funding on the scale required for offshore development extremely difficult to fund as the upfront investment is needed now with any payback a number of years away and not necessarily guaranteed. State investment in designated ports infrastructure is something that needs to be seriously considered for project Ireland to be successful, with a plan-led approach.
- There are many active Offshore Renewable Energy (ORE) policy, strategies, and legislative initiatives being progressed by various government departments. The facilitator of all ORE activity is whether **the port system capable of ensuring the delivery of a port structure that can function and co-exist with ORE**. The consultation on the 2013 National Port Policy should draw these strands together, [2], which closed in 2023 is an opportunity, but it is not to be delivered till 2025. This is a concern.
- The North Sea Energy Cooperation (NSEC) joint statement in 2022 [3] committed to accelerate Europe's move towards energy independence. **The nine NSEC countries, Ireland being a member, have agreed to reach at least 260GW of offshore wind energy by 2050.** This increases the urgency of Ireland delivering on its commitments.
- In Irelands Climate Action Plan 2024, in setting out the targets for Irelands Offshore Wind goals, it states that ''Central to achieving these goals is the strategic increase in the share of renewable electricity to 80% by 2030. This includes ambitious targets of deploying 9 GW of

onshore wind, 8 GW of solar power, and at **least 5 GW from offshore wind projects**.'' All Government plans should be marching forward to deliver this goal by 2030.

- Over the last 6 months a trilogy of Government policy and strategy documents have been released that set out Irelands approach to the harvesting of offshore energy and what we as a nation are doing to reap the benefits from this untapped natural resource and delivering this 'at least' 5GW of energy. While the documents in themselves are comprehensive and detailed, they all should be based on the same set of assumptions and workings. The three documents in question include **Powering Prosperity (Dept. of Enterprise, Trade and Employment),[4] Future Framework for Offshore Renewable Energy (Dept. of Environment, Climate and Communications), [5] and the Offshore Renewable Energy Technology Roadmap (SEAI).[6]** The first of these documents sets out the objectives around maximising the number of jobs that the sector can deliver and making Ireland a centre of technology excellence for the offshore industry. The Future Frameworks document in a sense follows on and looks at how we grow the industry from the early to mid-30's delivering 20GW in 2040 and 37GW by 2050. It looks at various scenarios around this.
- The most recently published SEAI document on the technology roadmap is of most interest in that looks from the outset that Ireland no longer has the target of a delivery of 5GW of offshore wind by 2030, and the maximum it looks at 3.2 to 3.3GW by 2030. This relates to the ORESS 1 auction held in 2023 and seems to be assuming that the South Coast DMAP will not be delivered until after 2030. It also misses out at the addition this year of both Oriel and the Arklow Back 2 sites into the mix**. Is the target of 5GW no longer policy?**
- '**Ports serve as indispensable hubs in the expansion of offshore wind energy and the energy transition**' [7]. Ireland needs at least 2 Ports to cover the full wind energy value chain in the immediate near term. The review document mentions a multi-port solution, though not necessarily wrong, but the realisation that specialisation for fixed bottom initially and floating wind should be planned in to specific strategic port or ports now for immediate implementation in this policy. For FLOW it is necessary to seriously consider co-location of both the manufacturing and installation ports. It would be prudent and logistically efficient.
- **There is no port in the ROI capable of deploying ORE**. Belfast is the only port on the island that can support fixed bottom installations at this time, [9], with the other option to use other UK or EU if available to us. This should be an Itish Government priority to solve, for the good of the economy and jobs and energy security. The North Seas Offshore Wind Port Study 2030-2050, issued in in November 2023, [8] says the following

    - Uncertainty about demand for port space: are NSEC countries converting ambitions into real projects? When will they implement these projects? There is currently too little clarity in Europe about the long term. This makes it difficult to secure investments and financing.
    - Unfavourable business case: the business case for the development of offshore wind ports is not attractive. Major long-term investments yield (too) little a return.
    - Technical risks: uncertainty about the technology required entails risks, such as excessive investments or unsuitable quays for future offshore wind farms.
    - Competition for space: ports have minimal space. There are also other parties that want to use the space which have clearer requirements and can offer ports more security and income.
    - A 'mismatch' of interests: delays in development of offshore wind port infrastructure do not directly affect the ports. It does, on the other hand, have major consequences for achieving offshore wind and climate goals.

Ireland cannot depend on other countries to provide a solution to port shortfall in Ireland. It is a pan Europe issue and Ireland needs its own solution.

- If Ireland wants to do most of the main offshore wind activities in its own ports, a **total investment of €2-3 billion** would be required.[8]
- Reports quoted in the *Issues Paper* for this multi-port approach need updating:
    - IPORES 2018 is in need of updating as **the technology and volume of product to be installed has increased rapidly**, [9], thus influencing the outcomes.
    - The Irish Ports Capacity Study issued in 2023 by Arup **does not account for the co-existence of ORE at Irelands ports**, where facilities and space need to be shared.
- The **competition for space** at ports to support the ORE industry and normal port activity is at a premium. **Blades are now 240m long weighing 65tonnes each and nacelles weigh 500 tonnes each.** ORE is space hungry, and the National Port policy document needs to future proof Irelands ORE designated ports to future proof them to remain sustainable as the rollout, particularly of offshore fixed wind on the east coast and floating wind on the west coast is maximised.
- The timeline of completion of National Ports Policy in Ireland by Q2 2025 needs to be review as the **issuing of the new Ports Policy is a matter of urgency** if we are to deliver on Irelands national commitments and reap the economic benefits through employment and added value work done at port.
- The components of an ORE system are well laid out and address the main processes in the recent Future Framework for Renewable Energy Policy Statement. [5] There is an acceptance of the need to look to the **maturity of technology** and this research would support that strategy but would look to see if the approach of **plan-led** may also be applied equally here. This would be done in consultation with the industry and in particular the turbine companies, looking at approving step level changes in MW rating of turbines, only as installation-based proof can be given on reliability, robust supply line and availability/capacity. This will assist in adding certainty to the rollout plan of Irelands ORE, and while it might seem to contradict the 'maximisation of more competitive technologies', it does not, as a technology is only competitive if it is proven to be reliable and obtainable. Bigger may well be better in MW capacity terms but only when it is proven and deemed to have reach an agreed level of maturity. The criteria would be drawn with the industry. The turbine size has a knock-on effect on all the components of the ORE system.
- Technology used in the building of the floating platforms in the FLOW scenarios is noted as being steel in the above-mentioned Future Framework consultation. It did not seem to consider the use of a potential concrete solution. **The advocation of concrete** as a mainly locally sourced solution within the island of Ireland should also be considered and run in all modelling, as in Workstream 4 of the Future Frameworks consultation. Within this work the reason for this consideration is documented, and it is believed it would be more beneficial to Ireland and its economy making Ireland more self-sufficient in this aspect of ORE development. All this is dependent and predicated on the finalisation of the design of a suitable solution, which is believed to be possible.
- Equally, concrete has a role in gravity-based foundations but there is insufficient information available, to the authors, to comment on the need for this type of base within the ORESS 1 developments. If there is a need it would be an excellent lead in to concrete being used in the ORE rollout.

- The use of concrete requires a skilled workforce in the related processes attached to using concrete and will develop on skill sets already available with the construction industry in Ireland. Steel fabrication required for the steel solution would not have a widespread similar skill set to build upon.
- As pointed out in the draft policy document ports are required to progress ORE and ''distinct infrastructures are required depending on the technology, particularly in the case of fixed bottom compared to floating wind.'' In the attached the points being made are that –
    - Concrete sets different requirements on the port infrastructure, but also creates opportunities for the ports.
    - Belfast cannot be assumed to available as it could be consumed by the UK planned rollouts. The UK plans are very aggressive.
    - Developments of Irish port infrastructure does not seem to be recognised in the WS documents as progress seems to be progressing and possibly availability might be earlier. The policy should look to develop Irelands own ports to support the schedule.
- **End of life planning** should be factored in even at this stage as it will have a direct effect on port infrastructure, supply line and logistics. While it is appreciated that the expected life cycle can be in the region of 20-25 years, the ramp up will commence in the 2040's and should be in the policy document.
- The industry needs to be the partner of the government in assessing technology maturity with the government in effect becoming the gatekeeper in the maturity of technology step changes. Maturity of technology is discussed in the attached, and with a mature product, suppliers who see a commitment to a product type for a set period in time, will be able to present a robust commercial proposition and they can match with schedule visibility.

  Also, if the cement/concrete route is chosen, the cement industry needs to partner with Government to deliver a low carbon product for the benefit of bringing down the countries carbon emissions level.

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Introduction

Europe and Ireland have been heavily committed to participating and committing to the various International Polices and Agreements on the environment and decarbonisation and Ireland has strived to take a leading role in renewable energy. The overarching aim of the European Green Deal (2019) is for the European Union to become the world's first “climate-neutral bloc” by 2050. The REPowerEU Plan was issued by the European Commission in May 2022, increasing the Renewable Energy Directive to 45% by 2030 and increasing the total renewable generation capacity to 1,236 GW by 2030, with an emphasises on offshore wind as a significant contributor. These directives very much drive Irish law and policy.

In an effort to align with these goals, Ireland has one of the most internationally recognised and revered natural offshore renewable wind energy resources in the world, potentially capable of supporting in excess of 70GW of offshore renewable energy production, adding in excess of €75Bn to the Irish economy by 2060, securing jobs and enabling climate targets to be fulfilled.

In 2023 the Offshore Renewable Energy Development Plan (OREDP II) set out a national level spatial strategy to facilitate a plan-led approach to offshore development in Ireland, identifying broad areas of interest suited to fixed & floating offshore wind (refined in Designated Maritime Area Plans (“DMAPs”) pursuant to the Maritime Area Planning Act 2021). It has been replaced by a statutory marine planning approach, established by the Maritime Area Planning Act. This has a hierarchical structure of an overarching, cross sectoral Marine Planning Policy Statement (to be formally adopted by Government in late 2024), a National Marine Planning Framework (adopted in 2021) and regional/sectoral DMAPs.

The Climate Action Plan (CAP) 2024 [9], has in it a guide to achieve 80% renewable electricity by 2030 with the addition of 5-7GW of wind resource and a target of a 100% renewable electricity system in the late 2030’s.

On the east coast a number of companies are focusing first on fixed bottom offshore wind turbine installations while they expect floating offshore wind technology to mature later. At a rate of deployment of between 1.2 to 1.5 GW/annum (between 80 to 100 turbines/year) Ireland can reach its wind targets commitments and achieve between 37-60GW of installed offshore wind by 2050. It is obvious that Ireland will need to ramp up construction. However, there is a realisation that the amount of construction required needs, at a minimum, 2 fully capable ports for fixed based turbines, which do not exist in the Republic of Ireland, today. These 2 ports must be constructed and must operate at capacity pre 2030 to accommodate the expected delivery schedule.

When the floating offshore wind farms become viable to install in the early 2030’s more ports are required as the construct of these ports will be different from fixed bottom installation ports. It is a major infrastructural national project and without ports capable of supporting these projects there will be issues in making the commitments promised. Work needs to begin on these in mid to late 2020’s.

In this paper we review key areas that can assist or hinder the development of the Offshore Renewable Energy project development in Ireland and make observations on some positive steps, but also raise concerns on items that are felt will work against delivering to plan.

The approach taken in this study was to examine key drivers that will have to be in place and aligned to ensure the smooth delivery of the ORE programme for Ireland. These form chapters in the following text and while not every aspect of the project was considered the following chapters look at key drivers in ensuring a smooth delivery of the national project. The aspects considered are as follows and they are a snap shot in time and how it stands today:

- **Framing of Ireland's Policies, Strategies and Legislation to Support Offshore Wind Development:** The status of the work of government in following its commitments under International and EU policy direction and its implementation and shaping of Irish policy and legislation is considered.
- **Review of Permitting Planning and Licensing in Ireland:** This section looks at a vital step in the rollout of ORE projects as is flagged international as a key driver in a successful national ORE project.
- **Ports**: The ability of ports to facilitate the rollout of all national ORE projects is seen as a key enabler for the process. What is the status of the ports sector in Ireland. This will include a mention of a key area in **End-of-Life Planning**: A brief look at what the thinking on this key aspect the project and what was found on this area.
- **Mature Technology**: Are of concern for the Irish ORE project is desire to go bigger on turbines too soon before the technology has matured and has proven reliability. This is explored and some conclusions put forward.
- **Floating Wind Status**: The initial phase of the ORE project will be to install fixed-bottom windfarms, but to maximise out territorial waters potential Irelands needs to install floating wind turbines along to west coast. A review is carried on the status of this technology and what it would mean to the Irish project.

Framing of Ireland's Policies, Strategies and Legislation to Support Offshore Wind Development:

EXECUTIVE SUMMARY

From this review it is evident that the need to have renewable energy sources at the core of Governments future plans is recognised. Attaining targets for greenhouse gas reduction and using renewable energy, is seen as one of the key modes of delivery. Offshore wind is very much the untapped resource to date, but progress is being made with the support of the governments approach. A delivery timeline now exists and the relevant changes and updates to policy and legislation have been made or in the process of being made, which is hoped will remove barriers to delivery in a timely manner.

A key development has been the role given to the Offshore Wind Development Taskforce (OWFT) to straddle the many government departments involved in the delivery of offshore wind. A number of new polices and strategies are emanating from the various workstreams, and it is seen a positive step. The OWFT is seen as a vehicle to delivery on the many actions emanating from this documents to assist in delivery of the required end goal.

Over the last number of years a suite of policies and legislation and policies have been assembled and establishes a positive policy framework which will inform all future decisions in the Irish Maritime Area and Offshore Energy. [10] The following pages highlight many of the key documents as the country progresses it an efficient framework.

The Maritime Area Planning Act, 2021, is a key primary legislation and establishes the framework for the maritime consenting process, along with establishing MARA and the enforcement agency. Also, in line with the EU Maritime Spatial Planning Directive, the National Marine Planning Framework was adopted by Government in May 2021, and this was Irelands first statutory maritime spatial plan. This led to the ability to ability to establish Designated Martine Area Plans (DMAPs), which in effect are building blocks to the rollout of ORE into the future in a controlled and plan-led way.

Aligned with this are other national policies such as the Climate Action plans, various Enterprise initiatives and policies along with policies of research and development in the ORE sector. The recent Offshore Renewable Energy Future Framework Policy Statement sets out a path for achieving the State's long-term goals by signposting a plan-led approach for ORE development from 2030-2050. [4]

Alignment of Conferences of Parties (COP) and European Union targets are stitched into the approach and from this review at a macro level, the building blocks are in place build for an offshore industry that will not only contribute to the delivery of the environmental targets but also allow the offshore potential in Ireland to secure a new manner of export from Ireland in the form of 'energy' but also maximise the potential for employment and financial stability for many years to come.

Time is not on Irelands side and legislative and legal bottlenecks are and need to be continuously addressed, but the legislative infrastructure is heading in the right direction. Has it been sufficiently resourced, people and most importantly technically skilled people, is something that is still open, while changes to the judicial processes should also benefit the timeline for delivery, once the relevant bills are passed? The coming few years will be critical for delivery.

FRAMING OF IRELAND'S POLICIES, STRATEGIES AND LEGISLATION:

To set the backdrop for this review of Government policy, it is clear that the advocacy for offshore wind is part of a global solution to promote a move to sustainable and renewable energy sources and away from traditional fossil fuel-based energy sources. The disruption to fossil fuel supply from Russia has put renewed emphasis on a localised solution. The following piece attempts to summarise the framework that ultimately influences Irish Government Policy, Strategy and Legislation and attempts to show why the current Irish pathway has been chosen. The move away from fossil fuels, seen as the major contributor to Greenhouse gases and climate change, paves the way for the need to develop renewable energy resources.

What follows is a summary which looks at firstly the International backdrop and its direction of travel in this key area. How that is being translated into European policy and legislation and how this in turn influences Irish government strategy, policy, and legislation. This is a global challenge and one that will influence a nations direction of travel.

INTERNATIONAL POLICY AND AGREEMENTS:

There have been a number of global conferences over the last 30 years that highlight the challenges that future generations will have to face unless the world tackles the damage being caused to the Earth and which is resulting in climate change.

There has been wide range of policy and international agreements around what needs to be done to tackle climate change and there has been a number of Conferences of Parties (COP) since the early 90's which has brought world leaders together to address these matters.

In June 1992 the United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro. It was known as the '**Earth Summit'**. The Rio Declaration established 27 universal principles, called the United Nations Framework Convention on Climate Change (UNFCCC). Other achievements were the Convention on Biological Diversity and the Declaration on the principles of forest management. [11] Ireland ratified the convention on the 20th of April 1994 and the convention reflected international consensus on the problem of climate change, and it has been ratified by 197 countries.

The 1st COP to outline specific targets was held in Berlin in 1995, but **Kyoto,** in 1997**,** was more significant. Per the UN website ''the Kyoto Protocol **operationalises** the United Nations Framework Convention on Climate Change by committing industrialised countries and economies in transition to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets. The Convention itself only asks those countries to adopt policies and measures on mitigation and to report periodically.'' [12] The targets were only binding on the large, industrialised countries that were mainly responsible for GHG emissions. Ireland ratified the Protocol on the 31st of May 2002 and became a party when it entered into force on the 16th of February 2005. There were 192 parties to the Protocol.

A Conference of Parties was held in **Paris in 2015**, which was COP 21. The Paris Agreement is a legally binding international treaty on climate change whereby countries aim to reach global peaking of greenhouse gas emissions as soon as possible.[13] The aim is to achieve a climate neutral world by the middle of the century. The agreement works in a 5-year cycle of ambitious climate action carried out by individual countries. Nationally determined contributions (NDC's) were to be submitted by 2020 as part of the Paris Agreement. 'The Paris Agreement is **a landmark** in the multilateral climate

change process because, for the first time, a binding agreement brings all nations together to combat climate change and adapt to its effects'[13]

The Glasgow Climate Pact resulted from COP 26, held in the UK in 2021. It brought parties together to **accelerate action towards the goals as set out in the Paris Agreement** and the UNFCCC. The pact had counties reaffirming the ''goal of limiting the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5 °C.'' And they went further, expressing "alarm and utmost concern that human activities have caused around 1.1 °C of warming to date, that impacts are already being felt in every region, and that carbon budgets consistent with achieving the Paris Agreement temperature goal are now small and being rapidly depleted."[14] It also looked to accelerate actions required, agreed to moving away from fossil fuels and delivery on climate finance. For the first time the agreement dealt with fossil fuels and their phasing out – and also a phase out of inefficient fossil fuel subsidies. This was a first even though coal, oil and gas have been seen as the main drivers of global warming. [14]

Though there was a **COP 27** in 2022 in the Egyptian coastal city of Sharm el-Sheikh, it did not add to work achieved at COP 26 and the focus was on agreement to provide "loss and damage" funding for vulnerable countries hit hard by climate disasters.''[15], but the above agreements set the back drop for the framing of the European Union's approach to climate change and in turn that of Ireland.

COP 28, in 2023 in Dubai, will have an influence on these policies. 'More than 100 countries at the COP28 climate summit in Dubai have agreed **to triple renewable energy capacity by 2030** - one of the least controversial commitments floated at the conference.' [16] This conference worked on linking climate action and nature conservation. 'COP 28 resulted in unprecedented recognition and momentum for linking efforts to address the climate and biodiversity crises. Alongside pollution, these make up the triple planetary crisis – the three, main interlinked environmental issues facing humanity.' [17] It went to recognise mature-based solutions in the decision around 'global stocktake' 'recognizing that nature and biodiversity are keys to mitigating a heating planet and protecting vulnerable communities from the impacts of a changing climate.'

To many this focus on the linkage between climate action and nature conservation was welcomed and has a key influence on the need to roll this out through EU and Irish legislation. The EU made a number of key commitments at COP 28 and two in particular, are noteworthy when looking at renewable energy sources. These are -

- to accelerate the transition away from fossil fuels this decade, to take action to reduce emissions by 43% by 2030 and set the world on a pathway to reaching net zero emissions by 2050.
- as part of the Global Pledge on Renewables and Energy Efficiency, to triple renewable energy capacity and double the rate of energy efficiency improvements by 2030. €2.3 billion from the EU budget will support the energy transition in the European neighbourhood and around the globe. [18]

These commitments, amongst others, increase the need for Ireland to deliver on its renewable targets and if anything, deliver them in a timelier manner.

EUROPEAN UNION POLICY AND LEGISLATION RELEVANT TO RENEWABLE ENERGY AND IN TURN, TO OFFSHORE WIND:

Europe has been a party to participating and committing to the various International Polices and Agreements that have been detailed in the previous section and has strived to become a world leader in renewable energy in order to deliver on its COP commitments. It has done this by using its ability to develop policy instruments in line with the COP agreements and also by focussing on development of expertise in renewable technology.

We will mention directives below and directives form part of the EU's secondary law. They are therefore adopted by the EU institutions in accordance with the treaties. Once adopted at EU level, they are then transposed by EU Member States, so they become law in the Member States.[19] In Ireland the Oireachtas may delegate the power to make legislation to a Minister of Government or other authority and this power is strictly circumscribed by the delegating instrument. EU Directives are usually implemented by way of Statutory Instrument made by a Minister. [20]

As the purpose here is to focus on the policies and objectives of the EU in relation to offshore wind the below figure taken from a European Marine Board paper on European Offshore Renewable Energy [21] encapsulates the key directives that have a direct bearing, on the development for EU members, of offshore wind, as a subset of the overall direction of travel in the renewable energy field.

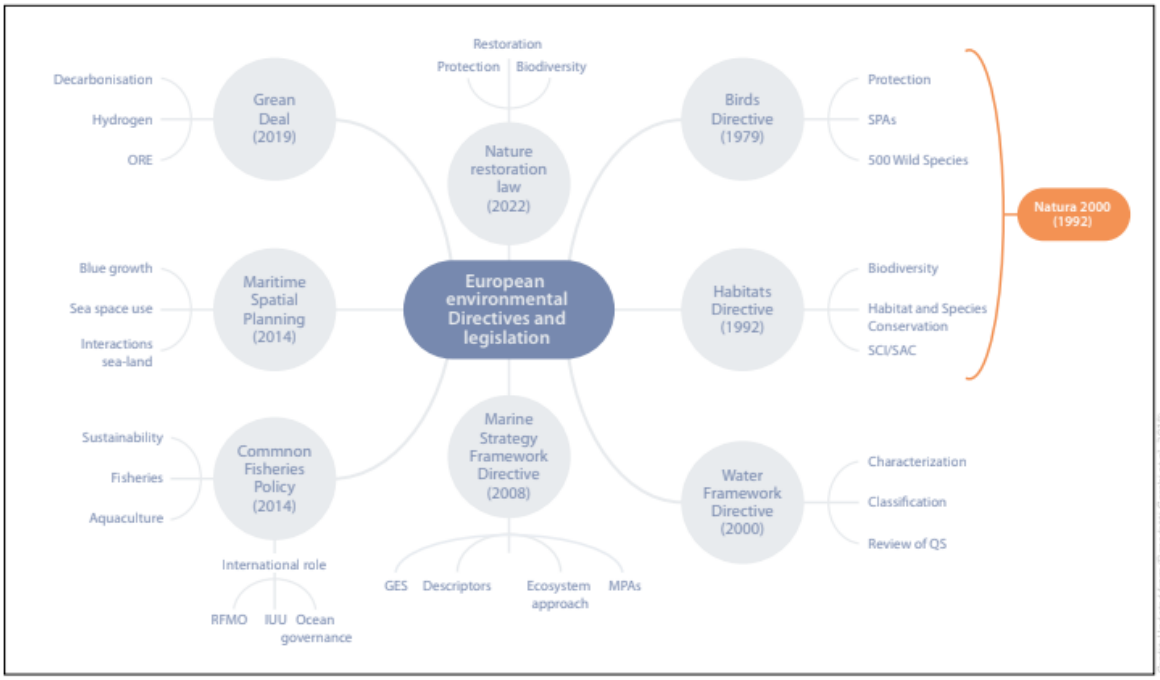


Figure 3.1 Key EU Directives regarding the seas and Ocean, where GES = Good Environmental Status, MPAs = Marine Protected Areas, QS = Quality Status, RFMO = Regional Fisheries Management Organisation, IUU = Illegal, Unreported and Unregulated fishing, SPAs = Special Protection Areas, SAC = Special Areas of Conservation, SCI = Sites of Community Importance.

Figure 1 EU Policies and Directives [6] EMB April 2023

The intent here is not to do a detailed review of each of the relevant policy or directive but do a quick synopsis of the intent of the relevant document.

European Green Deal (2019) – The overarching aim of the European Green Deal is for the European Union to become the world's first "climate-neutral bloc" by 2050. It has goals extending to many different sectors, including construction, biodiversity, energy, transport, and food. [22] This can be seen to be directly linked to the Paris Agreement in 2019. One of its key aspects is a goal around energy which makes it very relevant to this review.

Under the European Green Deal all EU Member States pledge to reduce greenhouse gas emissions by at least 55% by 2030 in comparison to 1990 levels. Targets for renewable energy and energy efficiency are also likely to be increased. In this regard, the Commission proposes to increase the binding target of renewable sources in the EU's energy mix to 40% and sets a new 2030 energy efficiency target of 36% – 39% for final and primary energy consumption.

Some key directives need to be noted here as they link very much to the Green Deal. The **Renewable Energy Directive, Directive (EU) 2018/2001**, (RED II) - It established a new binding renewable energy target for the EU for 2030 of at least 32%, with a clause for a possible upwards revision by 2023. This target is a continuation of the 20% target for 2020. [23]

In 2022 there was a vision in the form **of Revision of the Renewable Energy Directive: Fit for 55 package -2023** - RED III [24, p. 55] This was significant as it was against the backdrop of the Russian invasion of Ukraine and the subsequent fuel issues that arose. This European climate law makes reaching the EU's climate goal of reducing EU emissions by at least 55% by 2030 a legal obligation. EU countries are working on new legislation to achieve this goal and make the EU climate-neutral by 2050.[25] The recast **Energy Efficiency Directive** has been agreed. Final energy consumption, through energy efficiency, must be reduced by at least 11.7% in 2030 compared to forecasts for 2030 made in 2020. This is significantly more ambitious than the Fit for 55 proposal (9%) though not quite the **REPowerEU** aspiration (13%). Specific obligations would require the public sector to lead by example and wind energy is a key component. Another piece of work worthy of mention is the REPower EU plan issued on the 18th of May 2022, noted previously. The REPowerEU Plan (the Plan) was issued by the European Commission. What is relevant in the plan to this project is the increase in the Renewable Energy Directive to 45% by 2030 (up from 40% in the original Fit for 55 proposal) and most importantly, increasing the total renewable generation capacity to 1,236 GW by 2030, up from 1,067 GW. According to a paper by A&L Goodbody the boost in renewable energy will be delivered by combining solar, onshore, and **offshore wind**, with renewable hydrogen being key to replacing gas, coal, and oil in certain industries and in transport. **The Plan emphasises offshore wind as a significant future opportunity**, although it notes the need to strengthen supply chains and accelerate permitting processes.[26]. The EU felt it was important to have this in place ahead of COP28 UN Climate Conference and to show that Europe is delivering on its promises. RED III was adopted on the 9th of October 2023 and member states are required to bring it into law by 21st May 2025. [27] The finalised RED III establishes a new goal for the EU to increase the share of renewable energy in its total energy consumption to 42.5% by 2030, supplemented by an additional indicative target of 2.5%. This is an upgrade from the previous target of 32%, indicating the EU's heightened focus on combating climate change and promoting energy security.

These directives are very much in sync with the European Green Deal and its desire to be the first climate-neutral continent. These directives very much drive Irish law and policy.

There is one more strategy document worth adding and that is ''An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future''. The document sets out how it hopes to ensure that offshore renewable energy can help reach the EU's ambitious energy and

climate targets for 2030 and 2050. With this in mind the Commission published a dedicated **EU strategy on offshore renewable energy (COM (2020)741)** on 19 November 2020 which proposes concrete ways forward to support the long-term sustainable development of this sector. The strategy sets targets for an installed capacity of at least 60 GW of offshore wind and 1 GW of ocean energy by 2030, and 300 GW and 40 GW, respectively, by 2050. [28]

The Commission aimed to complement this with 40 GW of ocean energy and other emerging technologies such as floating wind and solar by 2050, through cross-border cooperation and the integration of offshore renewable energy development objectives in the National Maritime Spatial Plans which coastal states were due to submit to the Commission by March 2021.

It is worth noting REGULATION (EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018. This Regulation sets out the necessary legislative foundation for reliable, inclusive, cost-efficient, transparent and predictable governance of the Energy Union and Climate Action (governance mechanism), which ensures the achievement of the 2030 and long-term objectives and targets of the Energy Union in line with the 2015 Paris Agreement on climate change following the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (the 'Paris Agreement'), through complementary, coherent and ambitious efforts by the Union and its Member States, while limiting administrative complexity. [29] It is noted here as it the regulation that drives Ireland's National Energy and Climate Plan and is noted later.

ENVIRONMENTAL ASPECTS ARE MUCH IN FOCUS AT EU:

Environmental concerns are at the heart of EU legislation and reflects the thinking flowing through from the COP meetings. A key element of the EU Biodiversity strategy is Nature Restoration Law 2022/0195(COD). This calls for binding targets to restore degraded ecosystems in Europe. According to the Commission, European nature is in alarming decline, with more than 80% of habitats in poor condition. An extract covering marine ecosystems says the Law is about – restoring marine habitats such as seagrass beds or sediment bottoms that deliver significant benefits, including for climate change mitigation, and restoring the habitats of iconic marine species such as dolphins and porpoises, sharks, and seabirds.[30] On the 27th of February 2024, the EU's Nature Restoration Law was passed by the EU Parliament and it output of the work around 2022/0195, but there was been some watering down of the content. [31] The aim of the law is as follows:

'The Nature Restoration Law seeks to set multiple binding restoration targets and obligations across a broad range of ecosystems, including forests, agricultural land, rivers, marine habitats, and even urban areas. In total, by 2030 these nature restoration measures should cover at least 20% of the EU's land and sea areas, and all ecosystems in need of restoration by 2050. Member States would be required to develop national Nature Restoration Plans to achieve these targets, with these plans being assessed by the Commission to ensure compliance.'[1]

The **Birds Directive (Directive 79/409/EEC)** has been around for some time. [32] [33] It was adopted in 1979. It is one of the first pieces of environmental legislation to be adopted by the EU. It was amended in **2009 (Directive 2009/147/EC**) - changes were made to Annex II part B due to the accession of new Member States. [34] The directive provides a comprehensive framework for the protection, management and control of all wild birds naturally occurring in the EU. The directive

[1] https://data.oireachtas.ie/ie/oireachtas/libraryResearch/2024/2024-03-06_l-rs-note-eu-nature-restoration-law_en.pdf

instructs Member States to take measures to maintain populations of all bird species naturally occurring in the wild state in the EU (Article 2). Such measures may include the maintenance and/or re-establishment of habitats in order to sustain these bird populations (Article 3). [34]

The **Habitats Directive (92/43/EEC)** was adopted in 1992, 13 years after the Birds Directive. Like the Birds Directive, the Habitats Directive requires all Member States to establish a strict protection regime for species listed in Annex IV, both inside and outside Natura 2000 sites. This is an important piece of legislation.

In 2015, the Commission carried out a 'Fitness Check' of the EU Nature Directives to see whether they are 'fit for purpose'. The overall conclusion of the findings, published in December 2016, is that, within the framework of broader EU biodiversity policy, the two nature directives remain highly relevant and are fit for purpose. However, there needs to be a substantial improvement in their implementation if they are to achieve their objectives. [35]

From an environmental perspective, the **Strategic Environmental Assessment (SEA)** Statement that we mention later under Irish law, ties in Article 8 (Decision Making) of **EU Directive 2001/42/EC on Strategic Environmental Assessment; Article 16(2) of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations (S.I. No. 435 of 2004)** as amended; and Circular Letter PL 9/2013, Department of Environment, Community and Local Government. [36]

Strategic Environmental Assessment (SEA) is a process for the formal, systematic evaluation of the likely significant environmental effects of implementing a plan or programme before a decision is made to adopt the plan or programme. [37]

An **Appropriate Assessment Determination (AA) is** also required under Irish legislation, and this is in order to comply with the requirements of **Article 6(3) of the EU Habitats Directive and Regulation 42 of the European Communities (Birds and Natural Habitats) Regulation 2011 as amended (''the Birds ad Habitats Regulations''),** the process of screening for Appropriate Assessments are undertaking at an early stage in the drafting of Irelands National **Marine Planning Framework. (Ref: European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011) and Natura Impact Statement (NIS), 2022)**. [38] [39] [40]

In establishing the offshore windfarm industry, working with the fishing industry is key. **The Common Fisheries Policy (CFP)** becomes very relevant, and the latest version was adopted on 21 February 2023. ''Fishers, civil society, Member States, and the scientific community have contributed to the recovery of many fish stocks in the EU sea basins in recent years. However, more effort is needed to fully implement the CFP. This will contribute to a healthier marine environment and will maintain the profitability of the sector in the coming decades. Along with other priorities, it is crucial to support the revitalisation of coastal communities and improve their economic prospects with more innovation and technology''.[41] No offshore Windfarm industry will be successful without a joint approach with fishermen to sharing the maritime resources of our coast and the CPF acknowledges this.

The **Water Framework Directive (2000/60/EC)** requires EU member states to achieve good status in all bodies of surface and groundwater by 2027. [42] Some of the provisions have been transposed into Irish law under the Water Quality (Dangerous Substances) Regulations, 2001 S.I. No. 12 of 2001.

Also, the European Union Water Framework Directive (WFD) which was signed into law in October 2000 requires EU member States to achieve water quality of at least 'good status' in rivers, lakes, groundwater, estuaries, and **coastal waters,** by 2027 at the latest. The WFD has been seen as a

pioneering piece of legislation because it mandates public participation, recognising the value of local knowledge and community involvement in decision making processes. It is also relevant to offshore wind farms as much of the work in landing the energy will be in coastal waters and estuaries and is a factor to be considered in planning such projects.

Another piece of legislation worthy of note is the **Maritime Spatial Planning EU Directive 2014/89/EU**. The basis of the spatial plan has its origins in the Marine Spatial Planning process put forward by UNESCO. It ''is a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that have been specified through a political process''.[43] The most comprehensive European Ocean-related Directive is the **Marine Strategy Framework Directive (MSFD)** (European Parliament and the Council of the European Union, 2008) and subsequentially updated.

The MSFD lists eleven Descriptors of Good Environmental Status (GES), and embraces the ecosystem approach, recognising the paramount importance of biodiversity and ecosystem functioning. Descriptor 1 prescribes that biodiversity is maintained. Descriptors 2-11 consider a series of impacts arising from human activities and require that they do not cause significant harm to ecosystem functioning. The installation and operation of Offshore Renewable Energy must therefore respect these prescriptions. [21]

This is in turn forms the basis for Irelands Marine Spatial Plan in the form of the Offshore Renewable Energy Development Plan, which we will discuss later in this document.

IRELANDS NATIONAL CLIMATE CHANGE AND ENERGY POLICY AND LEGISLATION

In detailing this section, the focus is on three classification of documents which have been colour coded – Government Policies, Legislation, and Strategies. The colour code will be used to denote which is which though policies and strategies are closely related. These documents are intermingled on the timeline so best treated as they were published.

The previous pages act as an EU backdrop to the direction of travel that Ireland has trod over the last number of years. Ireland, within the EU, would see itself, at a strategy, policy, and legislation level, as aligning itself with the EU direction of travel and has mapped a course very much on the back of policies/directives reviewed above.

In recent years the Irish Government has introduced a wide range of climate and energy actions and followed closely the guidance of the EU. Ireland has also introduced ambitious targets to counter climate change in response to UN and EU objectives. This document is not assessing whether it has achieved these but sets out the main strategies, policies, and legislation shaping our direction of travel, but will take a view that on whether there should be concerns in reaching the goal. Are there concerns about the strategies, policy and legislation that has been actioned?

The **National Port Policy of 2013** [1] came back into the forefront of ORE work when a consultation process was carried out at the end of 2023. This policy did not cater for the co-sharing of parts with ORE back in 2013 and the consultation is attempting to tackle this. That said the policy set out a structure of Tier 1, 2 and 3 ports and set them up as individual companies with the objective of being commercial focused and where possible deliver a dividend to government. What is key is that *'The policy outlined in the 2005 Ports Policy Statement that the ports sector should receive no further*

Exchequer funding for infrastructure development or otherwise will be maintained.' This was confirmed in the 2013 policy as well. Therefore, the policy may no longer be suitable for the ORE scenario where major infrastructural investments will be required with a long-term payback model, which may not be possible in the current port model without government assistance in accessing funding or contributing to the infrastructure when it is seen to be in the national interest.

This was followed in 2015 with the Harbours Act [44], which allowed for the transfer of shareholdings in certain port companies to local authorities and into legislation the National Ports Policy.

One of the next significant documents is the **Offshore Renewable Energy Development Plan, 2014 (OREDP I)**. This government **strategy(vision)** provided a framework for the sustainable development of Ireland's Offshore Renewable Energy (ORE) resources, setting out key principles, policy actions and enablers for delivery of Ireland's significant potential. The OREDP I was guiding the State's strategy approach to achieving 5GW of ORE by 2030, mostly through fixed-bottom wind turbines in relatively shallow waters of up to 70 metres off the east and southeast coasts.[45] It also identified Ireland's coast as one of the most energy productive in Europe with a long-term potential of 70GW of ocean opportunity within 100km of the coast. It has since been superseded by **Offshore Renewable Energy Development Plan (OREDP II)** in 2023, which is the National Spatial Strategy for Transition to the Enduring Regime.

As stated above, **OREDP II** is a national level spatial strategy and is an important tool in setting out the overall framework and spatial strategy to facilitate the transition from a **developer-led approach to the enduring plan-led**. The reasons why the Irish government went in this direction will be dealt with elsewhere, but it is a significant change in direction, and had the effect of mothballing a number of projects that developers had invested time and money into. It is intended to be a **national spatial strategy** to support implementation of the marine planning framework established by the **Maritime Area Planning Act 2021, Marine Planning Policy Statement** and **National Marine Planning Framework.** It proposes a framework for identifying Broad Areas of Interest suited to fixed wind, floating wind, wave and tidal in the long-term, in this enduring phase. These areas would be refined in **Designated Maritime Area Plans** ("DMAPs") pursuant to the **Maritime Area Planning Act 2021**. It states that the criteria initially is focused on floating wind potential.[46], [47], [48], [49].

- Objectives: Key objectives are to assess the resource potential for ORE in Ireland's maritime area; to provide an evidence base to facilitate future identification of Broad Areas; and to identify critical gaps in marine data and recommend actions to close them.
- Principles: Several principles are outlined at section 3.6 of the OREPD II document, including that proposals for DMAPs will focus on the location for technologies to be situated in the maritime area, with cable routes to be considered at individual project level given the varying requirements of different technologies and need to consider specific location
- Policy Context and Other Jurisdictions: In addition to outlining the EU and national legal and policy context, DECC has summarised at section 5 approaches taken in Scotland, England, the Celtic Sea, the Netherlands, and Denmark, and is undertaking further comparative research.
- Environmentally, both OREDP document's talk about the need for doing **Strategic Environmental Assessments** (SEA) and Appropriate Assessments (AA). This is key from the environment perspective.

The **National Development Plan 2018-2027** was an important government strategy which was part of the evolution of current thinking and was issue in 2017. The broad theme of the plan is

"accelerating development efforts towards Vision 2030 without leaving anyone behind" with the primary goal of "creating a diversified and resilient economy for sustained growth and socio-economic transformation, driven by, among other things, by agriculture." [50]

In October 2021 the **National Development Plan 2021-2030** which updated the previous plan and provides the enabling investment to implement Project Ireland 2040 with the aim of making Ireland a better country for all while building a more resilient and sustainable future.[51]

The Energy **White Paper: Ireland's Transition to a Low Carbon Energy Future 2015-2030** was launched in 2015. It was a complete energy policy update. In it, the government set out a framework to guide policy and the actions that Government intends to take in the energy sector from now up to 2030. The paper considers European and International climate change objectives and agreements, as well as Irish social, economic and employment priorities. [52] It has been updated over time. Interestingly there are 25 mentions of offshore wind in the document.

It incorporated a vision of a low carbon energy system with Greenhouse gas (GHG) emissions from the energy sector reducing by between 80% and 95%, compared to 1990 levels, by 2050, and falling to zero or below by 2100. Amongst other measures for achieving a low carbon future, the White Paper identified the generation of electricity from renewable sources of which Ireland has a plentiful indigenous supply. It noted Ireland's 2020 overall renewable energy target of 16%.

In another government strategy paper called **Project Ireland 2040 - National Planning Framework,** Feb 2018, Project Ireland 2040 talks about the long-term overarching strategy to make Ireland a better country for all and to build a more resilient and sustainable future. The strategy ensures the alignment of investment plans with the stated National Strategic Objectives for 2040 in a considered, cohesive, and defined manner. This represents a shift from the approach of the past, which saw funding spread thinly across sectors and public investment decisions. Alongside the development of physical infrastructure, Project Ireland 2040 supports business and communities across all of Ireland in realising their potential. [53] **The National Planning Framework (NPF)** and the **National Development Plan 2021-2030** combine to form Project Ireland 2040. The NPF sets the vision and strategy for the development of our country to 2040 and the NDP provides the enabling investment to implement that strategy.[51]

The aim of Project Ireland 2040 is to construct an improved Ireland for all of us. By 2040, there will be approximately one million additional people living here in Ireland. This population growth will require hundreds of thousands of new jobs, new homes, heightened cultural, and social amenities, enhanced regional connectivity and improved environmental sustainability**.** Project Ireland 2040 sets out to deliver these.

On the topic of climate, the government in **2019** issued its first **Climate Action Plan** in order to tackle the Climate Breakdown. The Climate Action Plan sets out an ambitious course of action that it wanted to focus on, over the coming years and to address this climate issue. The policy document sets out the actions the Government intends to take to address climate breakdown across sectors such as electricity transport, the built environment, industry, and agriculture. The Plan sets a target for the generation of 3.5 GW of offshore renewable energy by 2030 and highlighted in Actions 25, 26, and 27, the need to support offshore renewables.[54]

It has been superseded by the **National Energy and Climate Plan (NECP) 2021 – 2030** in 2020. The plan reaffirmed Ireland commitment to achieving a 7% annual average reduction in greenhouse gas emissions between 2021 and 2030. This NECP was drafted in line with the then current EU effort-

sharing approach, before the Government committed to this higher level of ambition, and therefore does not reflect this higher commitment. It was written in accordance with the Governance of the Energy Union and Climate Action Regulation.

The current **Climate Action Plan 2023 (CAP23)** was published in 2022 and among the most important measures in the plan is to increase the proportion of renewable electricity to 80% by 2030 and a target of 9 GW from onshore wind, 8 GW from solar, and at least 5 GW of offshore wind energy by 2030 (and an additional 2 GW offshore wind for green hydrogen production). The plan was launched on 21 December 2022. [55] **Climate Action Plan 2023 (CAP24)** still talking about at least 5 GW of ORE but a change to the additional 2GW which now reads at 'New Flexible Gas Plant'. [56]

In the plan, it was set out that it would stablish a new State Agency, **The Maritime Area Regulatory Authority (MARA),** to grant and manage all future **Marine Area Consents (MACs)** beyond initial Phase 1 projects.

The plan was the first updated plan since the introduction of the **Climate Action and Low Carbon Development (Amendment) Act 2021**. CAP23 aims to keep Ireland's emissions within its mandatory carbon budget and achieve the legally binding target of reducing emissions by 51% (from a 2018 baseline) by 2030. Preliminary analysis suggests that this will require approximately €120 billion in investment between 2022 and 2030.

It also set out-

- its support for the **new state-led** consenting system for the Maritime Area and the development of ORE and
- adopt a statutory **Marine Planning Policy Statement (MPPS)** and develop Marine Planning Guidelines to support decision making by An Bord Pleanála
- Progress at pace the designation of marine **Special Areas of Conservation and Special Protection Area sites,** prioritised in line with the Government decisions.
- Progress the **mapping of all Irish offshore waters** through the INFOMAR Programme to support all marine activities, including climate effect monitoring and site selection for offshore energy.

In 2021, DECC issued a **Policy Statement on the Framework for Ireland's Offshore Electricity Transmission System**.[57] This policy outlined the shift from a developer led to a plan led development pathway for offshore wind. It noted a planned shift from the then current decentralised offshore transmission system to a centralised model. It stated that ''the enduring centralised model, with transmission system assets to be planned, developed, owned, and operated by Ireland's existing electricity Transmission System Operator, EirGrid, has been identified as delivering maximum societal benefits''. This followed the work of the Working Group on a Framework for the Offshore Electricity Grid, input from Navigant Consultants on their Options paper, [58], where they studied how other EU member states approach offshore electricity grid planning and put forward different models for consideration.

It also spoke about the phased transition to this new approach, which is reflected in the current pathway with Phase 1 having remained as developed led, but from Phase 2.1 onwards it will follow the state led approach and the DMAP steps.

Just to note that **Marine Planning Policy Statement** was issued in November 2019, with the draft **National Marine Planning Framework (NMPF).** The **Maritime Area Planning Act 2021** is one component of the **National Marine Planning Framework (NMPF)** which was published in summer

2021. Parallel to the National Planning Framework, the NMPF illustrates the vision for Ireland's maritime area, totalling approximately 495,000km2, until 2040.

It is Ireland's first Marine Planning Policy Statement. It applies to all facets of marine planning. It was introduced on a non-statutory basis, pending the introduction of legislation in 2020 that would provide for the preparation, adoption, and review of statutory marine planning policy statements on six-yearly cycles. It reflects the comprehensive updating and renewal now underway of Ireland's marine planning system, setting out core principles to inform evolving marine planning and development management process.

The **Marine Planning Policy Statement** published describes the existing components of Ireland's marine planning system. Outlines a vision for the future development of the marine planning system.[59]

As mentioned above **National Marine Planning Framework (NMPF)** in May 2021, was issued with the above policy **(MPPS).** It is the **first maritime spatial plan for Ireland**, prepared in accordance with the EU's Maritime Spatial Planning Directive. It was widely consulted on, and was subject to Strategic Environmental Assessment, during 2020. The development of the NMPF is a requirement under the **Marine Spatial Planning Directive (2014/89/EU**). [60]

The **NMPF** is the national plan for Ireland's maritime area and is the equivalent of the National Planning Framework onshore. The NMPF sits at the top of a hierarchy of plans and sectoral policies for the marine area. It comprises a single plan for the entire maritime area, with more detailed regional plans envisaged at a later date. The NMPF includes a number of **"Overarching Marine Planning Policies" (OMPPs),** which will apply to all marine activities or development. These OMPPs fall into three categories: Environmental, Economic and Social. Within these categories, the NMPF sets out more detailed policy imperatives including co-existence, biodiversity, coastal and island communities, and infrastructure.

Also, in 2021, the government issue **Policy Statement on the facilitation of Offshore Renewable Energy by Commercial Ports in Ireland 2021** [61]**.** The DoT policy decision was to go with a multiport approach to address the needs of the ORE industry and it was felt it was best suited to deliver the programme for government. It said that '*a multiport approach removes the risk of a single point of failure that could occur for financial, operational, environmental, or planning reasons. A multiport approach will ensure sufficient flexibility to deal with these uncertainties and that port capability can come on stream as required at a number of locations.*'

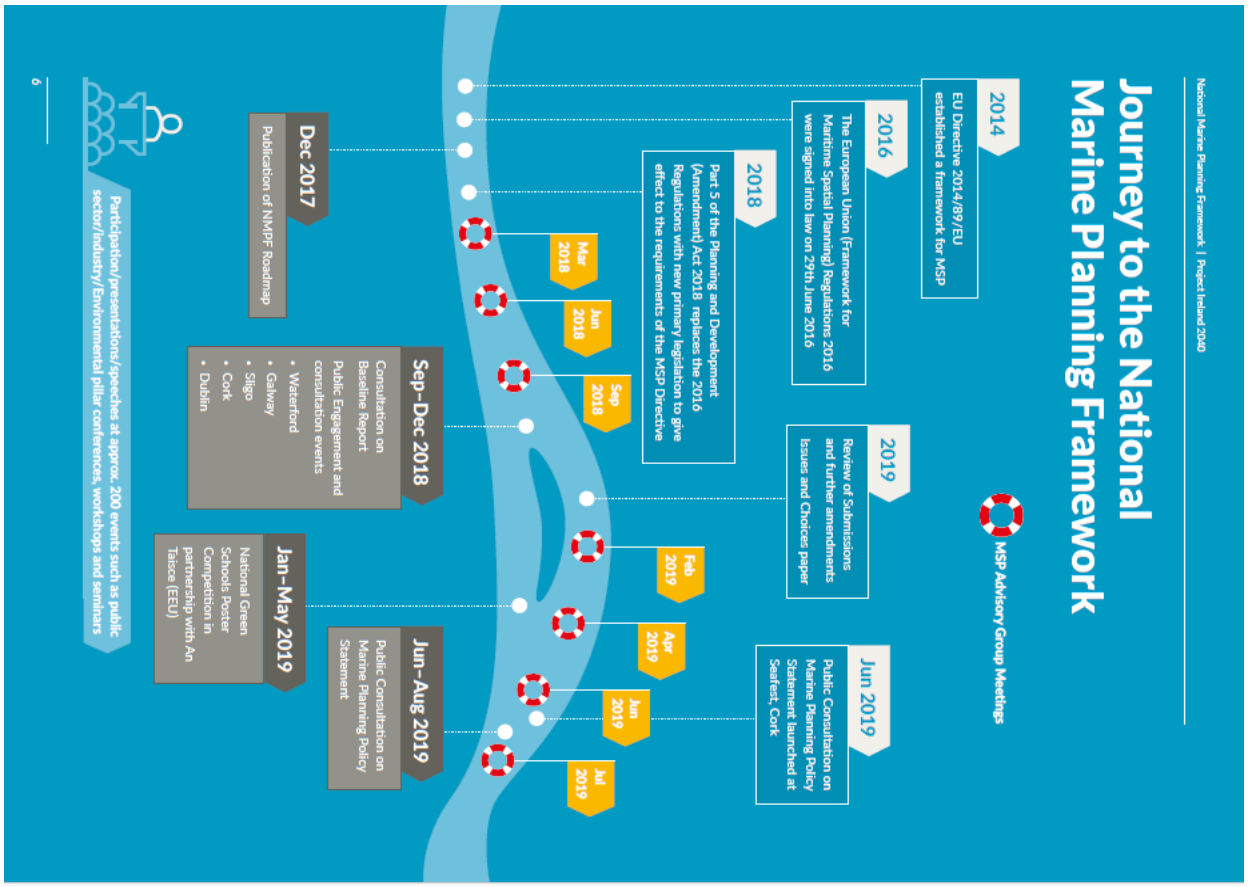
In the National Marine Planning Frame work document itself the illustration in Figures 7 and 8 capture succinctly the journey to issuing this document and ties in nicely the linkage between the EU directive and regulations, the amendment required in the Planning and Development Act 2018, linkage to the development of the **Marine Planning Policy Statement**, the linkage to the SEA/AA/Natura Impact process, and finally the output from this process was the NMPF established with the passing of it in the Dail in May 2021.

Ireland transposed the MSP Directive through Part 5 of the **Planning and Development (Amendment) Act 2018**. [62] The Act establishes the legal basis and broad framework for Ireland to implement MSP through the development of a maritime spatial plan (or plans) on a 10-year cycle. The Minster for Housing, Local Government and Heritage was given the role as competent authority for the purposes of the directive and was assigned the role of preparing this first spatial plan.

There are **16 objectives** and policies included and one is **'Support for offshore renewable energy proposals that assist the State in meeting the government's offshore renewable energy targets, including the target to achieve 5GW of capacity in offshore wind by 2030**'; 'Support for electricity transmission proposals that maintain or improve the security and diversity of Ireland's energy supply (including interconnectors and EU Projects of Common Interest), subject to environmental assessments'; 'Ensuring that proposals for offshore renewable energy and infrastructure support safety at sea imperatives'.[63] [64]

From an environmental perspective, it introduces this **Strategic Environmental Assessment (SEA)** Statement that has been prepared as part of the SEA of the National Marine Planning Framework (NMPF). It ties in Article 8 (Decision Making) of **EU Directive 2001/42/EC on Strategic Environmental Assessment; Article 16(2) of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations (S.I. No. 435 of 2004)** as amended; and Circular Letter PL 9/2013, Department of Environment, Community and Local Government. [36]

Strategic Environmental Assessment (SEA) is a process for the formal, systematic evaluation of the likely significant environmental effects of implementing a plan or programme before a decision is made to adopt the plan or programme. [37]



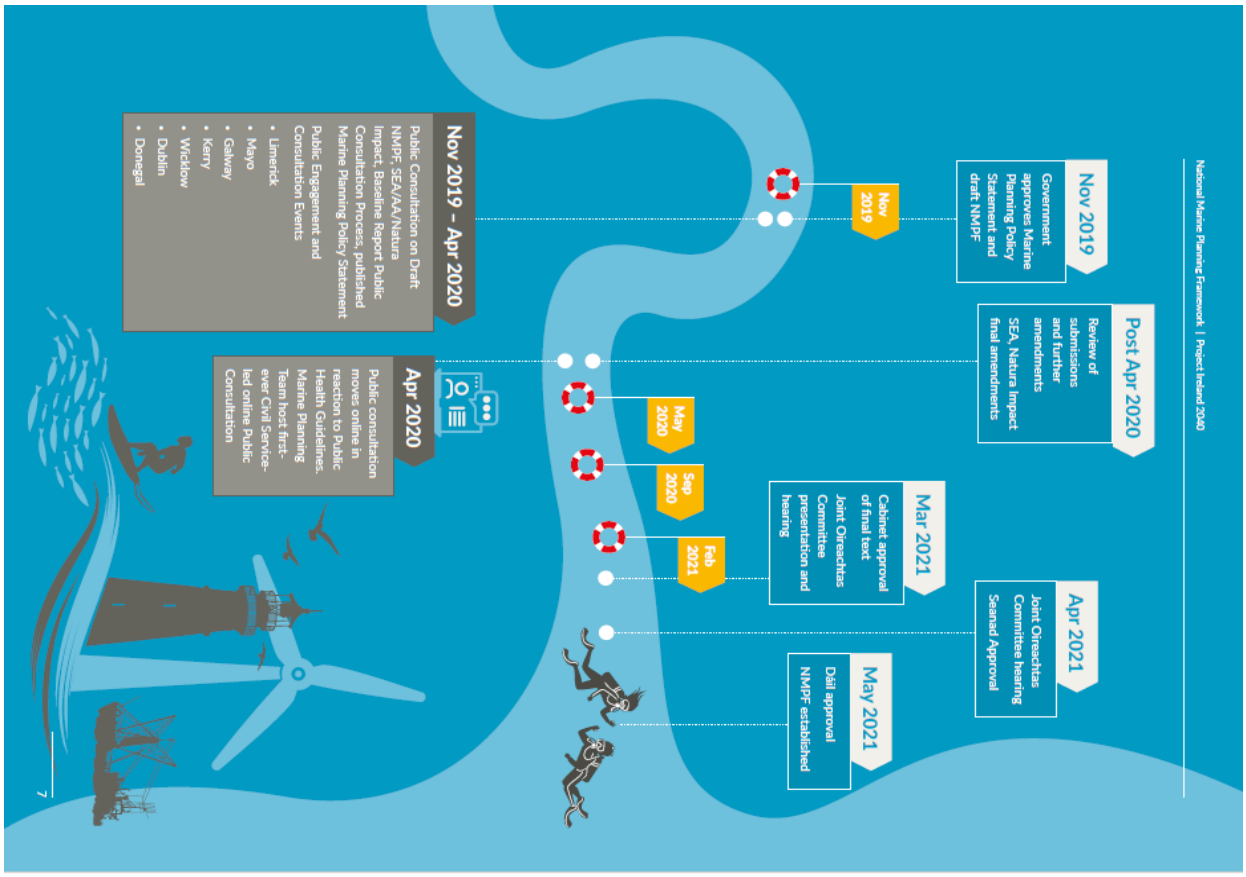


Figure 2 Journey to the National Marine Planning Framework [63]

It also details what is required in the **Appropriate Assessment Determination (AA).** This is in order to comply with the requirements of **Article 6(3) of the EU Habitats Directive and Regulation 42 of the European Communities (Birds and Natural Habitats) Regulation 2011 as amended (''the Birds ad Habitats Regulations''),** the process of screening for Appropriate Assessments are undertaking at an early stage in the drafting of the **National Marine Planning Framework. (Ref: European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011) and Natura Impact Statement (NIS), 2022)**. [38] [39] [40]

This **2019 National Energy and Climate Plan 2021-2030 (NECP)** was prepared in accordance with **Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action** to incorporate all planned policies and measures that were identified up to the end of 2019, and which collectively deliver a 30% reduction by 2030 in non-Emissions Trading Schemes (ETS) greenhouse gas emissions (from 2005 levels). Ireland's Climate Action Plan 2019, National Mitigation Plan 2017, and Energy White Paper 2015, align fully with the principles set out in the Energy Union strategy, and provide the national framework to transform Ireland into a low carbon society and economy. [29] [65]

In December 2023 DECC issued a **draft updated NECP 2021-2030** which is the required update of the 2019 plan. [66]

In **June 2020** the new government issued its **Programme for Government, Our Shared Future 2020.** In this the Irish Government committed to developing a plan setting out how Ireland will take advantage of the massive potential of offshore energy, as well as setting a 5GW offshore wind target by 2030. The Government target in the **Climate Action Plan 2023**, is to achieve 7GW (7,000MW)

capacity of installed offshore wind by 2030. [67] The additional 2GW's was to support potentially the hydrogen project.

A key policy statement was issued in the month of March 2023. It was the **Policy Statement on the Framework for Phase 2 Offshore Wind.** It stated that the deployment of offshore wind under Phase Two will take place through an accelerated work programme which will focus on near term delivery based on technology with proven scalability in other jurisdictions and will procure the additional offshore wind capacity required to meet Government's target of 5 GW of offshore wind by 2030. Phase Two Offshore capacity will continue to be procured through the Renewable Electricity Support Scheme (RESS), with the size, regularity and urgency of auctions required to meet the 5 GW target to be determined by onshore grid and marine spatial constraints, and the outcome of Phase One. A first auction to take place under Phase Two – ORESS 2 – which at that time was to launch by the end of 2023.

ORESS 2, and any subsequent Phase Two auctions, will exclusively procure a set volume of offshore wind capacity for development within individual Offshore Renewable Energy (ORE) Designated Areas, which will be designated according to legislative provisions for Designated Maritime Area Plans (DMAPs) in the **Maritime Area Planning (MAP) Act.** The process of developing ORE Designated Areas will provide opportunities for public participation and consultation, as well as requiring statutory environmental assessments. The location of ORE Designated Areas for Phase Two will be geographically aligned with available onshore grid capacity, in addition to being informed by environmental considerations including European sites and Marine Protected Areas.

EirGrid has identified currently available onshore grid capacity for further connection of offshore renewables of approximately 700 MW in total off the South coast of Ireland. The additional offshore wind capacity is intended to be split into two connections of approximately 350 MW each at different locations along the South coast. It is intended that the location of these onshore connection nodes will be geographically aligned with the first two ORE Designated Areas. ORESS 2 participants will compete for supports to develop 350 MW offshore wind projects within each of these Areas, or a 700 MW project within a single ORE Designated Area

The location of subsequent Phase Two ORE Designated Areas and Phase Two ORESS auctions will be determined by the availability of additional onshore grid capacity that may arise should Phase One projects fail to achieve a route to market or planning consent. For the avoidance of doubt, all Phase Two auctions will exclusively seek to procure offshore wind capacity located within ORE Designated Areas, including potential additional future auctions on the East or West coast should additional, grid capacity be identified by EirGrid following completion of Phase One.

Beyond Phase Two and the 5 GW objective, Government has further committed to introducing a new phase – Phase Three – which targets an initial 2 GW of floating offshore wind capacity off our South and West coasts. These projects are expected to be in development by 2030 and may include projects available for green hydrogen production and other non-grid uses.[68]

This seems **to open the door for floating wind** to be used but only in designated areas led by Government for the additional 2GWs.

Behind all these plans, policies, and strategy documents, is a series of enactments of **legislation** which support this direction of travel. What follows is a brief summary of what has been found, but a lot of centres around the planning process and empowering the various stakeholders.

The **Marine Planning and Development Bill 2019** was published but never enacted and superseded by the **Maritime Area Planning (MAP) Act** December 2021**.** This act regulates the 'maritime area' as defined within the **MAP Act.** These are as follows:

a) The sea and tidal areas of internal waters of the State as construed in accordance with the Act of 2021
b) the territorial seas of the State as construed in accordance with the Act of 2021
c) the exclusive economic zone as construed in accordance with the Act of 2021, and
d) the continental shelf.

This Act is one of a group of Acts included in this collective citation, to be construed together as one **Planning and Development, Maritime and Valuation (Amendment) Act 2022**, s. 1(3)). The Acts in this group are:

- **Maritime Area Planning Act 2021** (50/2021)
- **Planning and Development, Maritime and Valuation (Amendment) Act 2022** (29/2022), Part 3 (ss. 42-75)

It sets up Marine Area Regulatory Authority (Mara) April 2023. The MAP Act establishes a new planning regime for the maritime area and replaces existing state and development consent regimes, streamlining arrangements such that there is a requirement for:

- A single consent (Maritime Area Consent) to enable occupation of the Maritime Area
- A single development consent (planning permission)
- A single environmental assessment.

Under the Act, developers of offshore renewable energy projects must first apply to the newly established Maritime Area Regulatory Authority (MARA) for a Maritime Area Consent (MAC).

The MAC must be acquired prior to the development consent process. The development consent process is then to An Bord Pleanála who is the consent authority for such projects (under the amended **Planning and Development Act 2000,** Updated to 24th July 2023).

The Planning and Development, Maritime, and Valuation (Amendment) Act 2022 was signed into law on 24 July 2022. This new legislation will amend the **Planning and Development Act 2000**, as amended (the PDA).

The new legislation also introduces a few key changes to the **Maritime Area Planning Act 2021,** including:

- A new Chapter on judicial review of matters relating to a maritime spatial plan ('MSP') or designated maritime area plan ('DMAP'). Under the new section 33A, a public body which is concerned with a matter under this part may refer the matter to the High Court for a decision. The only way a person may challenge the validity of a decision or act done by a public body under this part in relation to an MSP or DMAP is through judicial review.
- Amendment of the provision relating to the appointment of a chief executive of the Maritime Area Regulatory Authority ('MARA').
- Specification that the development permission and the maritime area consent ('MAC') must be fully consistent with each other or that the updated provisions relating to reconciling the MAC and the development permission detailed below are followed before any right is conferred.

- Provision for amendment to the MAC where there is an irreconciliation between a provision of the MAC and a provision of a development permission for the maritime usage the subject of the MAC. This amendment will be to the extent necessary to remove that irreconciliation in favour of the provision in the development permission and all other provisions of the **Maritime Area Planning Act 2021**, as amended.
- Provision for special enforcement notices which will be issued by MARA when MARA is of the opinion that a relevant ground applies to a holder and the gravity or potential gravity of such ground is so great that the procedure related to a special enforcement notice should apply rather than the standard enforcement notice procedure.
- Specification of grounds for termination of a relevant authorisation, including for example failure to comply with development permission in respect of maritime usage the subject of permission where the failure is not remedied. [69] [70]

Two other S.I. support MARA's activities and cover the fee structures. S.I. No. 403/2023 - Maritime Area Consent (Certain Application Fees) Regulations 2023 and S.I. No. 402/2023 - Maritime Area Usage (Licence Fees) Regulations 2023. [71] [72]

The process will be similar to the strategic infrastructure development consent process. **An Bord Pleanála** is also responsible for the environmental assessment. The Act also legislates for the compliance and enforcement of MACs, licences, and offshore development consents. [73] [74] [75]

This also necessitated a revision to **Foreshore Act 1933 Revised Updated to 17 July 2023**. This relates a requirement if needed to survey within 12 nautical miles, which offshore wind developers would require to do. There are now only limited functions that may be performed by the relevant Ministers under the Foreshore Act 1933. [76] [77]

Note that is says the following in **Wind Energy Development Guidelines 2019**[2] that Offshore wind energy developments are currently **excluded from the provisions of the Planning and Development Act 2000 (as amended).** They are, however, **subject to the Foreshore Act 1933 (as amended).** The Foreshore Act 1933 (as amended) requires that a lease or licence must be obtained from the Minister for Housing, Planning and Local Government for the carrying out of works or placing structures or material on, or for the occupation of or removal of material from, State-owned foreshore, which represents the greater part of the foreshore. Construction of permanent structures on privately owned foreshore also requires the prior permission of the Minister. The Department of Communications, Climate Action, and Environment (DCCAE) has prepared the **Offshore Renewable Energy Development Plan, which is the OREDP II** previously mentioned. [49] [78]

There are other acts that are relevant and have been updated to accommodate these changes.

- **Planning and Development Regulations 2001 and 2003** - Details what is required in an Environmental Impact Assessment (EIA) amongst a lot of other areas relevant to seeking planning. Every developer who submits for planning needs to complete a detailed EIA. [79]
- **Planning and Development Act 2000 revised 24th July 2023** – This bill sought to amend the Planning and Development Act 2000; to provide An Bord Pleanála with powers, functions, and duties in relation to pending applications and appeals of long duration; and to provide for related matters. [80] [81]

[2] https://assets.gov.ie/109105/f2aab3bf-00b5-4dda-9a36-00db4bc3141f.pdf

Three policy statements were released in 2024 and are important to note - Powering Prosperity (Dept. of Enterprise, Trade and Employment),[4] Future Framework for Offshore Renewable Energy (Dept. of Environment, Climate and Communications), [5] and the Offshore Renewable Energy Technology Roadmap (SEAI).[6] No attempt is made here to critique these statements but they are important to put in context the direction been taken by Government.

Powering Prosperity (Dept. of Enterprise, Trade and Employment), [4] – Ireland's Offshore Wind Industrial Strategy, is the first of its kind by the Irish Government. It ''aims to build a successful, vibrant and impactful offshore wind energy industry in Ireland, ensuring that the sector creates as much value as possible throughout Ireland and maximises the economic benefits associated with government ambitions to deliver its 2030, 2040 and 2050 offshore wind targets.'' It is an action driven plan that will be monitored but seems to be aimed at the hi-tech and project planning sectors along with the support sectors for ORE. It does not focus to the same extent on the lower manufacturing jobs and assumes that this work, other than some tower manufacturing, will be done elsewhere. It is a strong document, but the actions need to be implemented for value to accrue.

The second policy document in this sector is the **Future Framework for Offshore Renewable Energy** (Dept. of Environment, Climate and Communications), [5]. This was the output from a consultation process started in 2023. It takes a view on delivering the goals for 20240 and 2050 and does not really take a short-term view. It says that ''Ireland has the potential to be a world leader in offshore renewable energy (ORE). The abundance of our significant natural resources means that with the right ambition, focus and collaborative approach, we can have our own secure supply of clean, renewable and affordable energy. At the same time developing indigenous green growth and taking full advantage of the emerging export market opportunities. This will also enable Europe to meet our goal of making the EU climate-neutral by 2050, in line with the Paris Agreement.

This potential can only be achieved with national ambition and with a strategic long-term approach. The Future Framework Policy Statement for Offshore Renewable Energy addresses both of those things. It outlines our long-term ambitions of 20GW by 2040 and 37GW by 2050, and our objectives, and it lays down a roadmap of how they will be achieved.'' Again, it is an action driven document with 29 actions, but again it is the opinion that it falls short in a number of aspects.it does not tackle port infrastructures, it does not cover the short-term requirements as they will need to be delivered for the future plans to be delivered and it does not seem to explore all options – such as in FLOW concrete v steel, port needs, floating on the east and south coast potentials, etc.

Though not a government department, the SEAI produced the **Offshore Renewable Energy Technology Roadmap,[6]**, which is reference as part of this trilogy of documents. It is a good document and details a lot of relevant information on this aspect. It does seem to work of different projections on energy deliverables that are contrary to the CAP24 details – looking at 3.2GW as against 5GW by 2030. It also glosses over the ports issue and the focus is on the high-end technology.

It is worth noting another document that came out in January 2024 called **Building Our Potential – Ireland's Offshore Wind Skills and Talent Needs** [82] ''This study is a comprehensive analysis of the opportunities for Irish businesses to be part of delivering the target of 37 GW of offshore wind energy by 2050. The recommendations outlined in the report include that significant investment in

training and skills development will be needed to maximise the economic benefit to Ireland from the development of offshore wind farms.''

Taking all these together they attempt to outline the strategy as to how we can as a nation, deliver on the 2050 targets. These are good documents but the lack of a plan that is meaningful is worth noting. A strategy is defined as a plan of action deigned to achieve a long-term or overall aim, but this game plan is lacking in how it will be delivered.

In the **Future Framework for Offshore Renewable Energy policy statement (2024)** acknowledges that more than one port is required, and it is the right approach. What seems to be lacking is an actual solution and plan. It talks about 'several port facilities in Ireland are required to meet 2040 and 2050 targets based solely on initial assemble and tow out requirements not including the Belfast port, which already has capacity to service ORE projects and may contribute to Irish ORE development.' This is referring to floating wind installation but does not offer up any solution to the immediate requirement to deliver the 2030 plan with fixed bottom. The policy document also refers to the **National Development Plan (NDP) 2021,** [51] and the Irish Maritime Development Office (IMDO) Irish Ports Renewable Offshore Services (IPORES) 2018 report.

The NDP does mention ports and the importance of the connectivity role that ports provide for Ireland. It refers the work on the National Ports Policy which was to commence in 2021. Currently this end its consultation phase in 2023 and is not due out till 2025. It says that it will allow 'a new Ports Policy to take account of required port infrastructure development to facilitate Ireland's future ORE sector.' It talks about the Department of Transport (DoT) and the IMDO continuing dialogue with the developers and looking into avenues in Europe of funding.

This leads to what can be seen as a void in the documents as published. There is NO short-term plan to cover the development of key infrastructural items like ports. In the Future Framework for Offshore Renewable Energy Policy statement (2024), it says that ''critical components of Ireland's ORE system including generation, storage, **PORTS,** and grid infrastructure are informed by the **National Development Plan (NDP).** A quick review of the NDP does mention ports and their role in the offshore wind rollout but the NDP focuses is the connectivity aspects of ports and that it notes ports are the facilitators of ORE. It talks about helping ports access European funding streams but does mention that that ''ports do not receive Exchequer funding.'' But there is no plan to develop a port infrastructure for ORE and it seems to be up to the ports to develop the plan on an individual site basis rather than a centrally co-ordinated national plan! A recent article heading by Infrastructure Investor puts it succinctly – Ports are 'quay' for offshore wind.

The NDP companion document the **National Planning Framework** – part of Project Ireland 2040, [53], currently in August 2024 is out for consultation, continues in the same theme with connectivity to the fore when it comes to ports. Nobody is arguing that this is not important but of equal importance is a roadmap to deliver a port infrastructure to facilitate the rollout of offshore wind.

An interesting quote found in both the NDP and NFP says ''Ireland benefits from naturally occurring deep water at ports in the south and south-west, which are capable of receiving the largest ocean-going vessels and offer the potential for industrial development that depends currently, or will depend in the future, on deep water berths.'' But in reality, when it comes to offshore windfarm activity this water depth in many ports is either at the limit or too shallow for offshore wind work. The reality is that we have LIMITED port capability to be develop for marshalling and manufacturing ports, due to marine physical constraints at the ports, for offshore wind farms. There is also the challenge of space required for offshore projects and there is a lack of quay space as well. For fixed

we have Rosslare, Cork and possibly Bremore and Bantry. For floating it is Shannon Foynes, possibly Cork and potentially Bantry and Killybeggs.

NEW PLANNING AND DEVELOPMENT BILL 2023 – WORK-IN-PROGRESS

This legislation currently, (December 2023), passing its way to the final stages in the Dail, replaces the Planning Act 2000. It was described by the DECC Minister O'Brien as the 'cornerstone legislation for Irish planning for the coming decades.' [83] It attempts to make this latest version of the planning approach 'fit for purpose' and with its stated intent to identify reforms required to deliver key infrastructure in housing, transport, and renewable energy.

Key reforms include:

- Improved consistency and alignment throughout all tiers of planning.
- Significant restructuring and resourcing of An Bord Pleanála, which will be renamed An Coimisiún Pleanála.
- Increased certainty across the planning system through the introduction of statutory timelines for decision-making, included for the first time, for An Coimisiún Pleanála.
- New strategic ten-year Development Plans for Local Authorities.
- Reform of planning Judicial Review, including the introduction of a Scale of Fees and Environmental Legal Cost Financial Assistance Mechanism; improving access to justice whilst regulating excessive legal costs.
- New provisions for Urban Development Zones, underpinning key growth areas.

The government will claim that it will bring 'greater clarity, certainty and consistency' to how planning decisions are made and will make the system more user friendly.

It does address the issue of timelines – the key time periods will range from 18 weeks for appeals of decisions of planning authorities to 48 weeks for strategic infrastructure projects.[84]

The bill also sets out planned changes to the judicial-review (JR) process for planning decisions.

It proposes to remove the application-for-leave stage, to reduce time spent in court and legal costs, while it also limits the ability of applicants to bring amended grounds beyond those originally filed in their applications.

The new bill also requires all JR applicants to have "exhausted any available appeal procedures or any other administrative remedy available in respect of the decision or act concerned".

The attempt here is tighten and shorten the time period in the JR process but also to make it affordable if required. There has been a significant increase in planning-related JR cases at a time when there has never been greater urgency to deliver on, amongst others, renewable energy targets.

To support the work to be done by the new An Coimisiún Pleanála, the Department of Housing, Heritage and Local Government has commenced a significant review of **resources** for the planning sector. Since October 2021, the Department has agreed to 117 new staffing posts in An Bord Pleanála (ABP). As of 31st August 2023, 238 people are working in ABP (including Board Members). It is

intended that when all the approved posts are filled, over three hundred people will be employed by ABP. This will represent a 50%+ increase in the overall agreed staffing at ABP since 2021. [85]

The Bill is currently before the Dail having been introduced earlier in 2023 and gone through updates and refinements. This Bill will be a key part of the legislative infrastructure on the planning side of offshore projects.

In October 2023 the Department of Enterprise, Trade and Employment issues a consultation on the **Development of a National Industry Strategy for Offshore Wind**. The intent is to 'set out a roadmap to ensure that Ireland captures a significant proportion of the value of the supply chain to deliver an Offshore Wind Energy (OWE) sector of scale and maximises the economic benefit associated with the various routes to market for this renewable energy, including new industrial demand, development of sustainable fuels, and so on.'[86] The intent is to focus of closing the supply chain gaps, and see what opportunities are available to develop our ability in research, development and innovation in this key area for the future. Irelands has to be able to position ourselves to reap the benefits from this industry which will grow over the coming years and last for many years to com. There is a need to maximise the employment aspects of offshore wind. This was reflected in the 2022 government **White Paper on Enterprise 2022-2030** [87]. The white paper set out its first objective as 'Integrating Decarbonisation and Net Zero Commitments' into a central tenant of government policy. It states that ''We will leverage the competitive advantage of Ireland's abundant renewable energy capability, particularly in offshore wind, to transform energy use by industry, provide greater energy security and price stability, generate energy exports, and develop a domestic supply chain and exportable expertise in renewable energy.''

There are a number of consultations that have taken place between Q4 2023 and Q1 2024 and these will be noted here for completeness. They are directly related to the offshore wind rollout and the outcome of this activity to awaited. These are positive draft documents and are trying to map the road forward to maximise the benefits to the State of completing a successful rollout of ORE.

- The National Ports Policy 2013, from DOT, was put out for consultation and the revised policy is due to be released in 2025. It has previously been mentioned and as Ports are seen as a key enabler the policy revision should be expedited as action is required now.
- Powering Prosperity – Irelands Offshore Wind Industrial Strategy (DETE) was issued out for consultation in Q1 2024. The document had the vision that by 2030 that Ireland would have built a successful, vibrant, and impactful new offshore wind sector creating value for the people of Ireland. The document outlines the pathway to developing the skills and capability to support the ORE industry, grow manufacturing and service-related industries, and to maximise the benefit through the development of new industries, to the economy in Ireland. The outcome of the consultation process will be monitored with interest. [4]
- The draft Offshore Renewable Energy Future Framework Policy Statement 2024, (DECC) was issued for consultation. It outlines the ambitions for the post-2030 period, the key processes needed for the successful deployment, and a pathway to maximise economic benefits to the state in this offshore renewable arena. [88]
- The final relevant document that is due out at the end of April 2024 in the current round, is the SEAI's Offshore Renewable Energy Technology Roadmap. This maps into the above-mentioned documents. [6]

In Summary there has been numerous policies, strategies and legislation evolving over the last 30 plus years. This snapshot captures the main drivers but has not looked at local government

involvement. In Ireland there is now **HAS a pathway** which is defined, and government led. Work is still evolving as can be seen from the last few documents mentioned but the question is to whether there is sufficient urgency in order not to miss on a major opportunity for the environment and also to help with the decarbonising of the economy.

EXECUTIVE SUMMARY

Accelerating permitting while maintaining public support. *Planning and permitting forms one of the biggest barriers to renewable energy growth globally. Challenges in wind energy permitting include lengthy bureaucratic processes and complexity of administration, lack of central authorities, lack of streamlined digital resources and lack of holistic planning to capture complex stakeholder interactions and lack of clear, shared understanding of the permitting rules between promoters and permitting entities.* [89]

This a statement from the GWEC's annual report Global Wind Report 2024 which echoes a common theme from many such reports. This is an area that is seen as a challenge to progressing both no and offshore developments. The recommend that countries need to accelerate the permitting process through –

1. Mandate maximum lead times to permit wind plants.
2. Implement a 'clearing house' type mechanism for legal disputes.
3. Dedicate centralised authorities and single focus points.
4. Invest in MORE staff digital resources.
5. Align land and ocean use guidance at national level – spatial planning.
6. Community engagement and promote dialogue.

In the following pages a review of these aspects of Ireland's offshore wind project are reviewed. Evidence has been found that efforts are in place to tackle points 1 to 6. Much work has been completed by Government departments to overhaul the system but that said Ireland's new permitting/planning/licensing process is untried, potentially under resourced and under skilled, combined with policy issues and slow progress with the legislation, with potential delays expected. It can be hoped that the introduction of the new Planning and Development Bill 2023 will resolve many of these issues, but progress is slow on its journey through the Dail.

The RePowerEU Council in 2022 recommended that EU countries need to accelerate their permitting process and that it should not take longer than 24 months on offshore projects. In duly justified extraordinary circumstances the period may be extended by up to six months.[90] The new Planning and Development Bill will address these issues in time it is believed.

The Department of Housing, Local Government and Heritage delivered the National Marine Planning Framework which laid the groundwork for all maritime activity to follow and a joint DECC/DHLGH effort delivered the Maritime Area Planning (MAP) Act shortly afterwards, completing overhauling and streamlining the marine planning system. In 2022, DECC developed the processes and awarded the very first Maritime Area Consents to allow the first offshore wind projects to progress planning and auction, EirGrid Group and the Commission for Regulation of Utilities (CRU) developed the offshore grid code from scratch and DECC established the whole-of-Government Offshore Wind Delivery Taskforce to mobilise our economy towards this great opportunity.

The Offshore Wind Delivery Task Force and what they can do to meet the accelerated ambitions is key. A number of the objectives on the state-led consenting regime have been delivered as mentioned – MARA, MPPS, Marine Planning Guidelines, INFOMAR, but it is behind on the MPA Bill.

In 2023 there has been the first offshore wind auction, ORESS 1, a collaborative effort between EirGrid, the CRU, DECC and the industry (Wind Energy Ireland) to deliver the largest renewable energy auction in the history of the State, at a highly competitive price that will shield energy consumers from price spikes for 20 years. Government has also agreed the Phase Two Policy, which adopted the permanent move to plan-led system to maximise whole-of-society gains.
The Department of Enterprise, Trade, Employment and Enterprise Ireland launched the process to develop an Industrial Strategy for Offshore Wind, the Department of Transport secured Connecting Europe funding for offshore wind deployment ports, and in 2023 Irelands dedicated maritime authority, MARA, was launched, along with the first offshore spatial plan proposal (DMAP), an agreed protocol for engagement with the Seafood Sector, the ORESS 2 consultation, the Hydrogen Strategy - with the Marine Protected Areas (MPA) Act and an overarching Spatial Strategy still to come later in early 2024.

So, from a task force perspective progress is being made. The taskforce also recently released the above mentioned 'indicative roadmap' towards the State's next offshore wind auction (ORESS 2.1). This helps in the building of momentum following on from the first auction earlier in 2023. Following feedback received through the ORESS 2 consultation, the roadmap has been drafted on the basis of an integrated MAC-ORESS process aimed at balancing the need to mitigate against speculative auction bidding, administrative efficiency, and Maritime Area Regulatory Authority's (MARA) obligations under the Maritime Area Planning Act 2021. [91]

On the downside some legislation is late but, on the way, and with this is place the outlook could be more favourable. In accessing Ireland against criteria mention in the review from the IRENA report listed in the review the following can be said -

- The establishment of dedicated central authorities and single focal points which can work with offshore wind developers to streamline the siting and permitting process. ***This has been completed by the Irish Government with the establishment of MARA and the reform of ABP.***
- The promotion of active dialogue between local authorities, communities, and industry to ensure shared understanding of priorities and solutions during the consenting and construction stages of wind projects. ***This has been completed by the Irish Government but yet to proven for its effectiveness. The Planning and Development Bill 2023 will address this.***
- The mandating of maximum lead times in the offshore wind energy plant permitting process. Following the award/concession of an area for offshore wind development, a maximum of three years from the application for administrative authorisation is suggested. Additional discretionary time could be allowed under extraordinary circumstances. ***Timelines are in place under the Planning and Development Bill 2023, once enacted.***
- An improvement in the capacity of the personnel responsible for the permitting process. This could be achieved by investing in more staff and digital resources for the various decision-making authorities involved. ***As detailed above, resources have been addressed in the new Bill on Planning and Development.***
- The development of digitised and searchable for land registration and for the siting of renewable energy projects. These databases should include an inventory of local ordinances

and records of places where projects have met community resistance. ***The Irish registries are already digitalised and come of the best in Europe.***

- The alignment of land and ocean-use guidance at the national and subnational levels. This guidance should prioritise projects which support energy security, the principles of 'Do No Significant Harm', biodiversity and the green economy. ***MARA, MPPS, Marine Planning Guidelines, INFOMAR, MPA Bill, OSPAR and the new Planning and Development act have the environment at its core.***
- The implementation, as a national priority, of a clearing house mechanism for legal disputes to prevent extended delays to critical infrastructure projects. There should also be a structured and time-limited process for developers to provide evidence, if so required. ***The setting up of the Environment and Planning Court as a division of the High Court has been welcomed. Plus, the new Planning and Development Act 2023 is addressing elements such as the Judicial Reviews.***
- An acceleration in the permitting and deployment of critical energy infrastructure, such as grids. This should be both offshore and onshore, reinforcing the infrastructure required to transport offshore power, where needed. ***The fact that the government has adopted a plan-led approach, with EirGrid integral to this, this should ensure that the grid will be developed in line with the plan to bring on the requisite GWs from the offshore windfarms in locations that will have the infrastructure in place.***

REVIEW:

The purpose of this chapter is to explore whether Ireland, through its licensing/permitting, will have a system that will be adequate to support the ambitious goals of the Irish Government for 2024 and beyond. Planning Permission, as a part of bringing any project online in Ireland, has been an issue for many years and combined with the 'newness' of offshore wind in Ireland, do we have the processes in place to support this key step?

The approach is to take a macro view of what is seen as best in class in this global industry and look at want is happening in Ireland currently.

The EU Commission's strategic vision for achieving a climate neutral economy by 2050 has been well stated as it strives to achieving a climate neutral economy by 2050.[92] By this they mean an economy with net-zero greenhouse gas emissions, which is at the heart of the EU's European Green Deal [93] and meets the requirements of the Paris Agreement. [94] The European Climate Law writes into statute that the goal set out in the European Green Deal for Europe's economy and society is to become climate-neutral by 2050. The law also sets the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.[95]

Over the last number of years and as detailed elsewhere in Irelands approach, policy, and strategies, legislation have been framed against this backdrop and though not going doing a detailed review here, it is of interest to take a look at the frameworks that are being employed in Ireland against global frameworks.

There are a number of reports that have been reviewed and before a benchmark is taken as to where Ireland stands, a brief snapshot of models that have been seen will be referenced. The World Bank

Group issued a 2022 report as part of their Offshore Wind Development Program [96] and discussed a roadmap for the Philippines who is relatively new to this industry, and they have signed up to the Paris agreement objectives. The below diagram lays out succinctly the stages in their view of the basis for a successful offshore wind approach. The steps are clear in the model and as it is new clean canvas, so to speak.

Figure 3 Priority Themes to create a Successful Offshore Wind Industry Model [96]

While this is set for an emerging market, it is also applicable to what Ireland has done and is doing. In offshore terms Ireland is an emerging market. The Vision has been set now and enshrined into legislation and to a certain extent the processes have been created but not proven as of yet. The supply chain element is still to be explored as 4 licences have been issued in 2023 and their challenges are still to be met.

The electricity infrastructure is also being worked upon with EirGrid tasked with delivery a grid that can take this offshore wind energy over the coming years through re-enforcing the current grid and building new grid structures where required.

In creating processes, you actually create potentially the frameworks for the success of the offshore wind industry. In an ESMAP/World Bank Group report in 2021 called Key Factors for Successful Development of Offshore Wind in Emerging Markets [97], it sets out a framework that they believe, is required to deliver an offshore wind industry. As you would except there is common elements with our previous model (Figure 1) but, in Ireland in particular, the government have led a path through Marine Spatial Planning, Leasing, Permitting and the Offtake and Revenue phases and the question that is being asked is have they got it right? On the positive side all these elements have been addressed and but the question to ask is to what degree they have got it right. In most cases, it is too early to judge, but these key steps/frameworks are now in place which is what is important.

Figure 4 Frameworks required to deliver an offshore wind industry [97]

Having establish the framework that covers the transition by the Irish Government to the current policy and legislative framework, it is prudent to see how this relates to best practice in other jurisdictions. Two aspects would need consideration here:

1. Is the policy and legislative framework suitable to deliver the intend Offshore Wind targets?
2. Is the framework resourced, to be able to deliver the objectives?

Due to the relative newness of the framework it probably difficult to draw a conclusion on point 2. The CEO of MARA was appointed in July 2023 and the structure and organisation is only being built so its capability is really an unknown at this point but one that needs to be monitored over the coming months. Point 1 though is where we can have a look now.

So, is the policy and legislative framework suitable to deliver the intend Offshore Wind targets?

''However, the last 12 months saw a growing implementation gap between declared targets and the rate of annual installations. To accommodate an exponential growth in offshore wind installations and a consequent acceleration of the global energy transition, ***decisive action on leasing, permitting****, market design, supply chain, infrastructure – including grid and port facilities – as well as regional collaboration remain of crucial importance. ''* [98]

GWEC Global Offshore Wind Report 2023

One of the first significant documents in this area is the **Offshore Renewable Energy Development Plan, 2014 (OREDP I),** which was replaced in 2023 with OREPD II. This government **policy** was published in 2014 and it provided a framework for the sustainable development of Ireland's Offshore Renewable Energy (ORE) resources, setting out key principles, policy actions and enablers for delivery of Ireland's significant potential. The OREDP I was guiding the State's policy approach to achieving 5GW of ORE by 2030, mostly through fixed-bottom wind turbines in relatively shallow waters of up to 70 metres off the east and southeast coasts.[21] It **was a developer led policy** which allowed developers work on projects around the Irish coast line very much in the manner of the UK framework currently employed. It also identified Ireland's coast as one of the most energy productive in Europe with a long-term potential of 70GW of ocean opportunity within 100km of the coast. It has since been superseded by **OREDP II** in 2023, which is **the National Spatial Strategy for Transition to the Enduring Regime.** [99]

Specifically, Ireland's Marine Spatial Plan is called the **National Marine Planning Framework (NMPF)** [63] and was formally launched in July 2021. [100] This framework, was applied to define Irelands maritime area of approximately 495,000km², and it outlines a vision for how Ireland wants to use, protect, and enjoy these seas in the years up to 2040. This fulfils and achieves the requirements as set out in the **EU Maritime Spatial Planning (MSP) Directive** [60]

Just to note that the **Marine Planning Policy Statement** [101] was issued in November 2019, with the draft **National Marine Planning Framework (NMPF).** The **Maritime Area Planning Act 2021** [102] is one component of the **National Marine Planning Framework (NMPF)** which was published in summer 2021. Parallel to the National Planning Framework.

It is Ireland's first Marine Planning Policy Statement. It applies to all facets of marine planning. It was introduced on a non-statutory basis, pending the introduction of legislation in 2020 that is to provide for the preparation, adoption, and review of statutory marine planning policy statements on six-yearly cycles. It reflects the comprehensive updating and renewal now underway of Ireland's marine planning system, setting out core principles to inform evolving marine planning and development management processes.

From an EU perspective the Marine Spatial Planning Directive 2014/89/EU [60] its objectives include the sustainable development of the energy sector at sea, and may work to avoid and prevent conflicts between offshore wind farms and other interests that converge in the marine environment, offering greater certainty and security to investors and government alike in marine renewable energy and helping to overcome and reduce the processing times required for the installation of these facilities.[103] The need for the MSP is key to moving forward and this has been delivered upon under this current scheme of legislation. The ability of the MSP to avoid and deal with potential conflicts around the environment is key and the avoidance of marine protected areas and Natura 2000 sites. The other directives such as the Habitats Directive (92/43/EEC) [104] and Birds Directive (2009/147/EC) [105] will all be factored into this process, plus other relative environmental ones.

The Marine Planning Policy Statement that was published describes the existing components of Ireland's marine planning system. It outlines a vision for the future development of the marine planning system.

As mentioned above, the **National Marine Planning Framework (NMPF)** in May 2021, was issued with the above policy. It is the first maritime spatial plan for Ireland, prepared in accordance with the EU's Maritime Spatial Planning Directive. It was widely consulted on, and was subject to Strategic

Environmental Assessment, during 2020. The development of the NMPF is a requirement under the **Maritime Spatial Planning Directive (2014/89/EU**). [60]

The NMPF is the national plan for Ireland's maritime area and is the equivalent of the National Planning Framework onshore. The NMPF sits at the top of a hierarchy of plans and sectoral policies for the marine area. It comprises a single plan for the entire maritime area, with more detailed regional plans envisaged at a later date. The NMPF includes a number of **"Overarching Marine Planning Policies" (OMPPs),** which will apply to all marine activities or development. These OMPPs fall into three categories: Environmental, Economic and Social. Within these categories, the NMPF sets out more detailed policy imperatives including co-existence, biodiversity, coastal and island communities, and infrastructure. [64]

There are **16 objectives** and policies included **and one is 'Support for offshore renewable energy proposals that assist the State in meeting the government's offshore renewable energy targets, including the target to achieve 5GW of capacity in offshore wind by 2030**'; 'Support for electricity transmission proposals that maintain or improve the security and diversity of Ireland's energy supply (including interconnectors and EU Projects of Common Interest), subject to environmental assessments'; 'Ensuring that proposals for offshore renewable energy and infrastructure support safety at sea imperatives'.

From an environmental perspective, it introduces the **Strategic Environmental Assessment (SEA)** Statement which has been prepared as part of the SEA of the **National Marine Planning Framework (NMPF).** It ties in Article 8 (Decision Making) of **EU Directive 2001/42/EC on Strategic Environmental Assessment; Article 16(2) of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations (S.I. No. 435 of 2004)** as amended; and Circular Letter PL 9/2013, Department of Environment, Community and Local Government.

Strategic Environmental Assessment (SEA) is a process for the formal, systematic evaluation of the likely significant environmental effects of implementing a plan or programme before a decision is made to adopt the plan or programme. [106]

It also details what is required in the **Appropriate Assessment Determination (AA).** [107] This is in order to comply with the requirements of **Article 6(3) of the EU Habitats Directive and Regulation 42 of the European Communities (Birds and Natural Habitats) Regulation 2011 as amended ("the Birds and Habitats Regulations"),** the process of screening for Appropriate Assessments are undertaking at an early stage in the drafting of the **National Marine Framework. (Ref: European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011) and Natura Impact Statement (NIS), 2022)**. [108] [109]

In reference back to the previously noted Figure 2, from the World Bank [97], it referred to Spatial Marine Planning ‘’as deciding in broad terms where it is most beneficial to site offshore wind projects, taking a holistic view of marine resources, avoiding areas of high environmental and social risk’’.

Action has been taken and the next steps in the development of Irish waters for offshore wind are based on Irelands Marine Spatial Plan, and its designating future development areas through the DMAP process, once the environmental and other criteria are considered.

LICENSING/LEASING:

What is meant by licensing/leasing?

The stage in the development of the offshore project is the giving of rights to a project developer to survey a potential site, then eventually to construct and operate a wind farm. But what is the process by which an area is assigned to a developer?

In a paper back in 2018, deCastro et al, called 'Overview of Offshore Wind Energy Resources in Europe under present and future climate' [103] found that the licensing process has been pointed out by the EU and other scientific literature that they reviewed as one of the major obstacles to the development of marine renewable energies. It can be complex and often stymied by multi-agency involvement and other bureaucratic barriers. They highlighted to need to streamline the licensing procedures by improving co-ordination between various agencies and the reduction of the number of consenting bodies. Back then there was already a well establish twin track route be it centralised or decentralised.

Ireland has chosen a Plan Led/Centralised model, having started with a developer led/decentralised process. The government announced a change in this year. Is this the right direction and how did we get there?

The significance of **Offshore Renewable Energy Development Plan (OREDP II)** [110] is that it set out the overall framework and spatial strategy to facilitate the transition from a **developer-led approach to the enduring plan-led approach**. This was a significant policy change by the Irish Government and took the industry by surprise in some respects.

The Plan Led model for issuing of licences/leases would seem to have its basis in a detailed report commissioned by EirGrid and completed by consultants Navigant in 2020, called Offshore grid delivery models for Ireland. [111]

This report conducted a comprehensive review of international approaches and developed four delivery model options that are tailored to the Irish environment. They focussed on a comparison, in an international context, of a producer led model versus a plan led model and also produced two hybrid version, in between, which were also considered. The producer led model is associated with the UK while the plan led model is more associated with the Netherlands. Figure 3 below is an extract from the report and define these models.

Developer-led model	Plan-led model
Developers prepare the requirements for consents, select and pre-develop wind farm sites and develop and build both offshore wind farm and transmission assets (offshore substation, export cables and onshore connection assets). This model is applied in e.g. the United Kingdom.	A State Body and/or the TSO is the responsible party for the complete process of wind farm site selection and pre-development and offshore grid connection development. This model is applied in e.g. the Netherlands.

Source: Navigant.

Figure 5 Developer Led V Producer Led [111]

The intent here is not to regurgitate the report which it is very comprehensive but to extract some salient points. They do a comparison for a number of countries and how they manage this key area, and the figure below captures the elements reviewed. Remember that this approach is driven from a GRID perspective, but within the Ireland context, the ability of the electricity grid to take this extra load being generated by offshore wind is dependent on the grid's ability to take the input. The

development of any renewables in Ireland is very dependent on the robustness and development of the grid in a controlled and structured manner.

Figure 4 below, illustrates the roles and responsibilities within the spectrum of grid delivery models across North-Western Europe. Ownership, operation, and maintenance of the offshore wind transmission assets is under all models the responsibility of the party constructing them, with the exception of the UK where the ownership and maintenance is the responsibility of an Offshore Electricity Transmission Operator (OFTO) and the operation the responsibility of the Transmission System Operator (TSO).

Figure 6 Allocation of roles and responsibilities within the grid delivery models across North-Western Europe. Source: adapted from Wind Europe, 2019. [111]

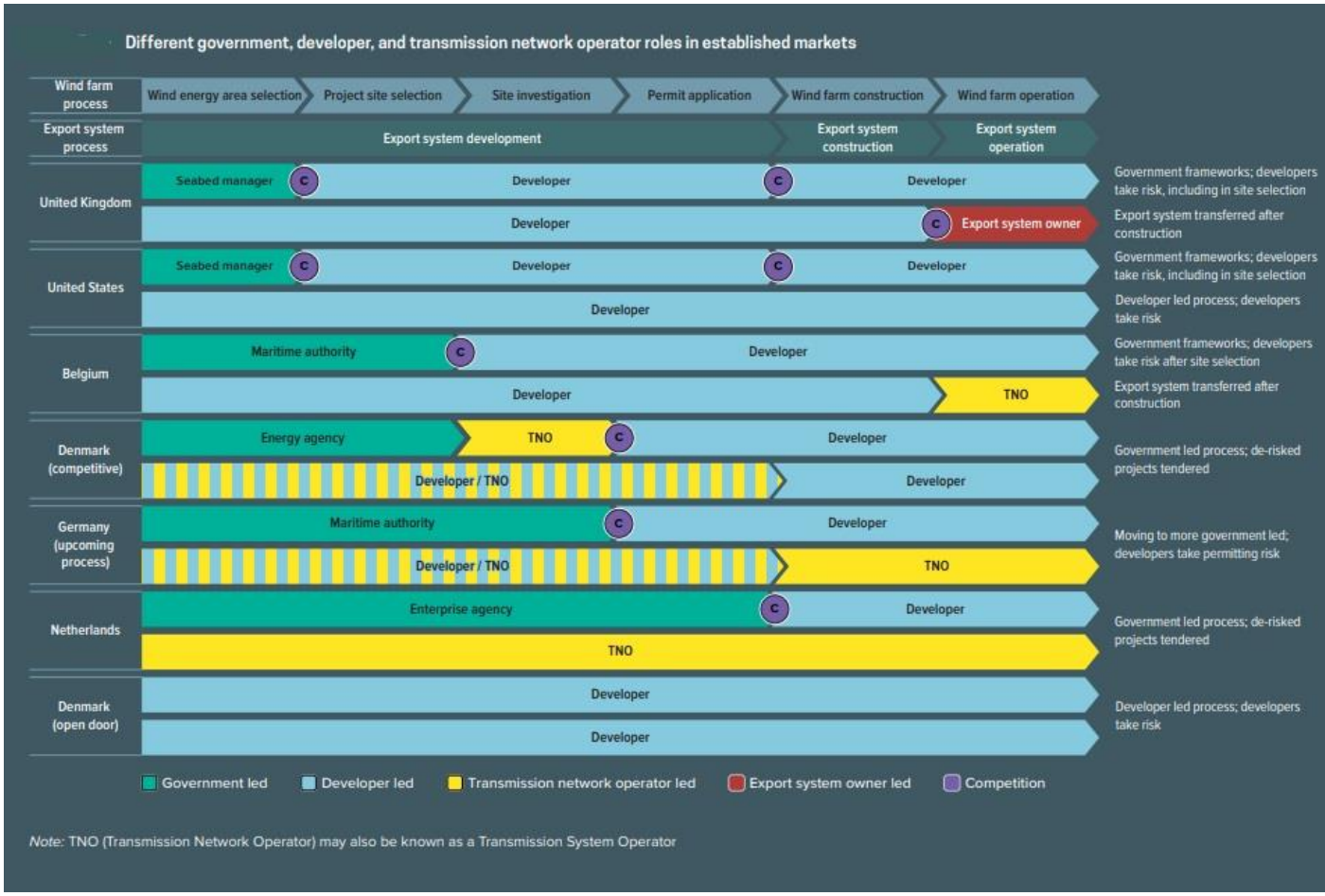


Figure 7 Different Government approaches to Licensing/Leasing 2021 [97]

This detail in Figure 5 is very similar and from the World Bank document referenced early. This chart was done two years later the Navigant report, and little has changed, except with the addition of the USA. This analysis stems back to work done by Wind Europe in 2019 in their paper Industry Positions on how Offshore Grids should Develop. [112] One significant change in the above figures was noted in the Global Wind Energy Council (GWEC) report called Global Offshore Wind Report 2023 [98]. In their discussion on the Danish status, it said that they had operated an open-door model. This allowed developers to freely submit lease applications in designated seabed areas at their discretion. This was pioneered by Denmark but has since been put on hold as it may infringe on EU law. Their new maritime plan will not allocate development areas to developers under this open-door approach.

The UK is also a developer-led model, with the UK Governments Crown Estates auctioning off designated areas of seabed for development. The UK is one of the biggest developers of offshore wind to date globally.

The Netherlands model is very much the model that the Irish Government followed with its change to plan-led approach. Interestingly none of the documents reviewed actually advocates one model over another.

In the Irish context the first real mention of a future model for Ireland is in the EirGrid commissioned report mentioned above. In the first section of the report, the two main grid delivery models, detailed above in Figure 3, were analysed by Navigant based on economic/financial, technical,

regulatory/policy and international parameters. Subsequently, they were assessed against seven key drivers in the Irish context.

These seven key drivers, which impact the choice of a model, include:

1. Cost Levels,
2. Environmental Impact,
3. Future proofing of policies and technologies,
4. Required infrastructure,
5. Compatibility with Relevant Projects,
6. Social acceptance
7. Facilitating the timely development of offshore wind capacity to achieve the 2030 targets.

As mentioned previously, this report came up two hybrids as well and Figure 6 and 7 sets these out.

Option 1. Developer-led	Option 2. Plan-defined, developer consents and builds	Option 3. Plan-led, developer builds	Option 4. Plan-led
Fully developer-led grid delivery model	State defines minimum distance from shore for wind farms, as well as grid connection points and available onshore grid capacity for RESS auctions; EirGrid pro-actively plans and coordinates onshore grid reinforcements	Developers responsible for offshore wind farm transmission asset construction, ownership, operation and maintenance in plan-led model	Fully plan-led grid delivery model

Source: Navigant.

Figure 8 Details the grid delivery model options assessed for Ireland following the phases of a project timeline. [111]

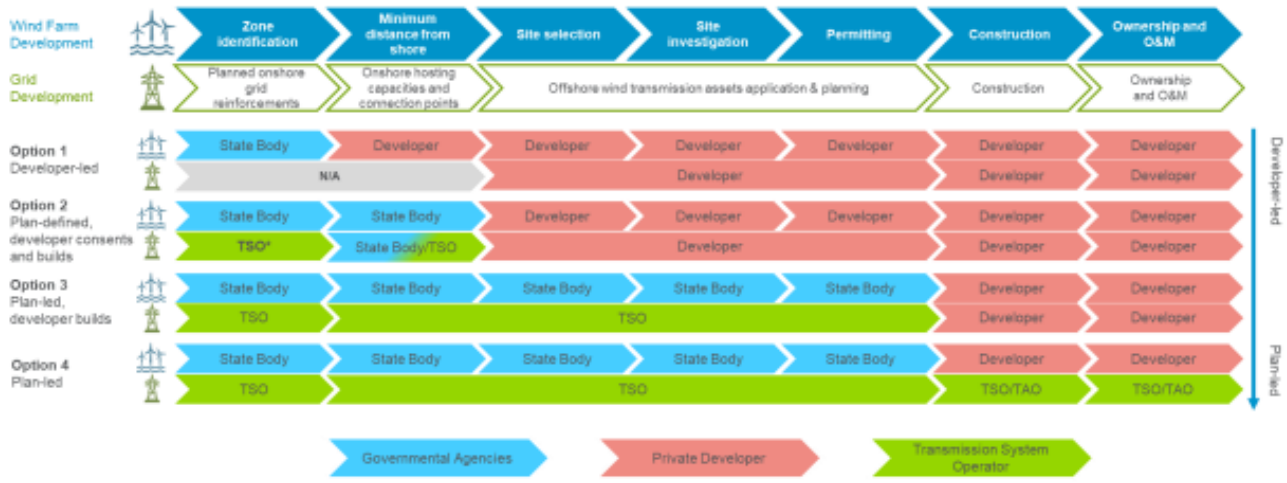


Figure 9 Grid delivery model options for Ireland following the phases of a project timeline. [111]

** In option 2 the TSO will pro-actively plan and communicate the timeline for onshore grid reinforcements early in the development process. Source: Navigant.*

Throughout the 114-page report it explores the pros and cons of each model, and the purpose of the report was not to intended to come to decision but was to present evidence of the variants and lay out the advantages and disadvantages. It would be left to others to make the final decision.

In the International Renewable Energy Agency (IRENA) report in 2023, Offshore Wind Scale Up-innovations in permitting [113] defines the permitting process as a key part of the deployment process for offshore wind. The scope of permitting process includes the conducting a marine spatial planning and environmental and social impact assessment. It also covers stakeholder engagement and the process of gaining the required approvals during the project development lifecycle.

It mentions that three models exist – centralised, de-centralised and hybrid models, which equate to plan led, developer led and hybrid again. It notes that European best practice has found that the centralised model helps decrease risk for the developers, as the government, as in Irelands case, takes control of the process. The decentralised model makes a couple of process changes to give developers more of the risk, but also greater flexibility. The model chosen is usually based on a mix of political, financial, and cultural reasons, they say, and that dictates the model chosen.

In all reports reviewed the same point is made, in that the key stakeholders would be the ones that they recommend should make the final decision and will be governed by the reasons above and hopefully, for the good of the country.

Ultimately the **Climate Action and Low Carbon Development (Amendment) Act 2021**, [114] came down on the side of the Plan Led approach and in the Navigant report the Pros and cons of such a decision are summarised by them as follows:

''The advantages of the plan-led model include long-term onshore-offshore transmission coordination with the potential for reduced infrastructure, the ability to craft a coordinated public acceptance process covering multiple projects and ease of future proofing of technology. The disadvantages include the time needed to develop new governmental capabilities, policy, regulatory, licence and legislative frameworks which are required, challenges with state bodies simultaneously developing multiple offshore and onshore renewable energy and transmission projects and incompatibility with Relevant Projects.''

The Irish Government has addressed the disadvantages listed above with the above-mentioned act and the formation of MARA, but the adequate resourcing of this is a further challenge!

In its Policy Statement on **Framework for Ireland's Offshore Electricity Transmission System 2021**[57] the government signalled its intent in adopting the centralised plan led approach by saying that ''A phased transition from the current decentralised offshore transmission system model to a centralised model over the course of this decade, to take place in line with three scheduled offshore RESS auctions. The enduring centralised model, with transmission system assets to be planned, developed, owned, and operated by Ireland's existing electricity Transmission System Operator (TSO), EirGrid, has been identified as delivering maximum societal benefits.'' It would be phased transition from a developer/de-centralised approach to a plan led/centralised approach and noted it would happen over 2 phases. [115] Ownership of the grid will rest with EirGrid at all stages of the phased transition. Ownership of all transmission assets, including the high voltage transmission circuits and associated onshore and offshore transmission infrastructure connecting offshore generation sites to the existing onshore system, as well as any necessary offshore reinforcements to accommodate electricity flows. All specifications used by offshore developers will be in line with EirGrid specifications and the entry points onto the grid will be assigned by EirGrid to the developers, which will in turn will influence the government's plan led scheme.

Indications are the shift in government policy is factored into this approach which was advocated by EirGrid. Ireland is therefore closely aligned to the approach in the Netherlands and slightly modifying the earlier figures. In Figure 8 the flow in Ireland would look similar to the Dutch.

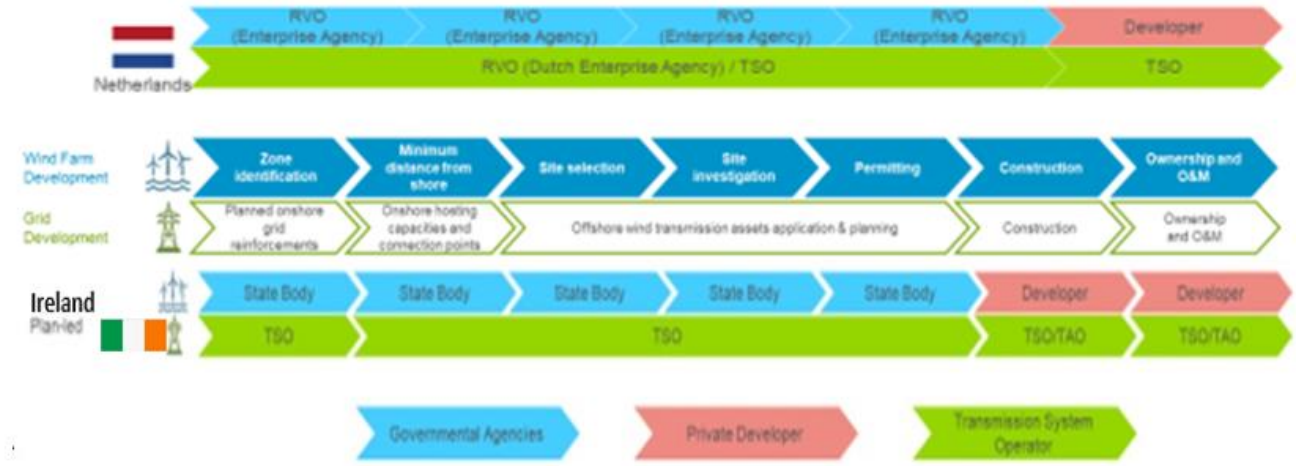


Figure 10 Ireland Work Flow similar to the Netherlands – adapted from Boeve et al [111]

In 2023 the government signalled an acceleration of this plan led approached. The **Climate Action Plan 2023 (CAP23)** [116] was publish in 2022. In the plan, it was set out that it would establish a new State Agency, **The Maritime Area Regulatory Authority (MARA),** to grant and manage all future **Marine Area Consents (MACs)** beyond initial Phase 1 projects.

Phase 2 Projects are intended to bridge the gap between the volume of capacity that can be delivered in Phase 1 and the 2030 offshore target (5GW). The Selection process for Phase 2 Projects was consulted and a policy statement was delivered in 2023. This phase will also introduce the plan led DMAP approach starting with 2.1 in the South East of the coast, which has been consulted on and expected confirmation of the DMAP area is due in Q1, 2024, along with the terms for the ORESS 2.1 auction.

This approach was the first updated plan since the introduction of the **Climate Action and Low Carbon Development (Amendment) Act 2021**. [114] CAP23 aims to keep Ireland's emissions within its mandatory carbon budget and achieve the legally binding target of reducing emissions by 51% (from a 2018 baseline) by 2030. Preliminary analysis suggests that this will require approximately €120 billion in investment between 2022 and 2030.

It also set out:

- its support for the **new state-led** consenting system for the Maritime Area and the development of ORE and
- adopt a statutory **Marine Planning Policy Statement (MPPS)** and develop Marine Planning Guidelines to support decision making by An Bord Pleanála
- Progress at pace the designation of marine **Special Areas of Conservation and Special Protection Area sites,** prioritised in line with the Government decisions.

Ireland has reached the point where it is following this centralised or plan led approach. How does this stack up with permitting/licencing approaches in other countries. Two recent reports by IRENA and GWEC, both publish in 2023, offers some insight as to where the Irish Governments policy sits.

The International Renewable Energy Agency (IRENA) and Global Wind Energy Council (GWEC) worked together to produce a report called Enabling Frameworks for Offshore Wind Scale Up [113].

The IRENA report published its findings based on reviewing and presenting a number of case studies cited in the report. It considered the permitting process as a fundamental step in deploying Offshore technology. It looked at three previously mentioned models that it says, that exist today.

Though stated previously, it is no harm to repeat what these models are. These are '**centralised, decentralised and hybrid'**. European best practices show that the centralised model helps decrease risks for developers, as governments take control of the process. The decentralised, two-stage model changes this to give developers more of the risk, but also greater flexibility. The hybrid model is a combination of the other two and can be adapted easily to particular country contexts. Indeed, while any of these models could be used, it is the particular political, fiscal, and cultural backdrop of a country that determines which should be used.'

A key aspect of all three models is the conducting of marine spatial planning (MSP) and the environmental and social assessment (ESIA) as well as stakeholder engagement. In effect the work done by the Irish Government with the introduction of **National Marine Planning Framework (NMPF)** in May 2021, puts in place this the MSP and SEA requirements. The IRENA report lists 8 key recommendations:

- The establishment of dedicated central authorities and single focal points which can work with offshore wind developers to streamline the siting and permitting process.
- The promotion of active dialogue between local authorities, communities, and industry to ensure shared understanding of priorities and solutions during the consenting and construction stages of wind projects.
- The mandating of maximum lead times in the offshore wind energy plant permitting process. Following the award/concession of an area for offshore wind development, a maximum of three years from the application for administrative authorisation is suggested. Additional discretionary time could be allowed under extraordinary circumstances.
- An improvement in the capacity of the personnel responsible for the permitting process. This could be achieved by investing in more staff and digital resources for the various decision-making authorities involved.
- The development of digitised and searchable for land registration and for the siting of renewable energy projects. These databases should include an inventory of local ordinances and records of places where projects have met community resistance.
- The alignment of land and ocean-use guidance at the national and subnational levels. This guidance should prioritise projects which support energy security, the principles of 'Do No Significant Harm', biodiversity and the green economy.
- The implementation, as a national priority, of a clearing house mechanism for legal disputes to prevent extended delays to critical infrastructure projects. There should also be a structured and time-limited process for developers to provide evidence, if so required.
- An acceleration in the permitting and deployment of critical energy infrastructure, such as grids. This should be both offshore and onshore, reinforcing the infrastructure required to transport offshore power, where needed.

They summarised these in the following figure 9:

Figure 11 IRENA Report 2023 Enabling Framework for Offshore Wind Scale Up [113]

The report goes on to discuss the merits of the centralise (Plan-led), Decentralised (Developer-led) and the hybrid approach. Again, it does not lean towards any of these approaches, but it says the model chosen would be dependent on the political, fiscal, and cultural backdrop in each country and this determines the choice of model. The various models progress at different speeds typically in different environments.

It also states that the that the foundational steps for each model which influence the speed of which permits are awarded include, but not limited to Marine Spatial Planning; Environmental and Social Impact Assessments; and the gaining of permit approvals to support the installation of offshore wind turbines.

The below figure gives us some indicative timelines and puts the project duration into perspective. It shows the key stages in the cycle to bring on shore wind on board and in either model the timelines are similar.

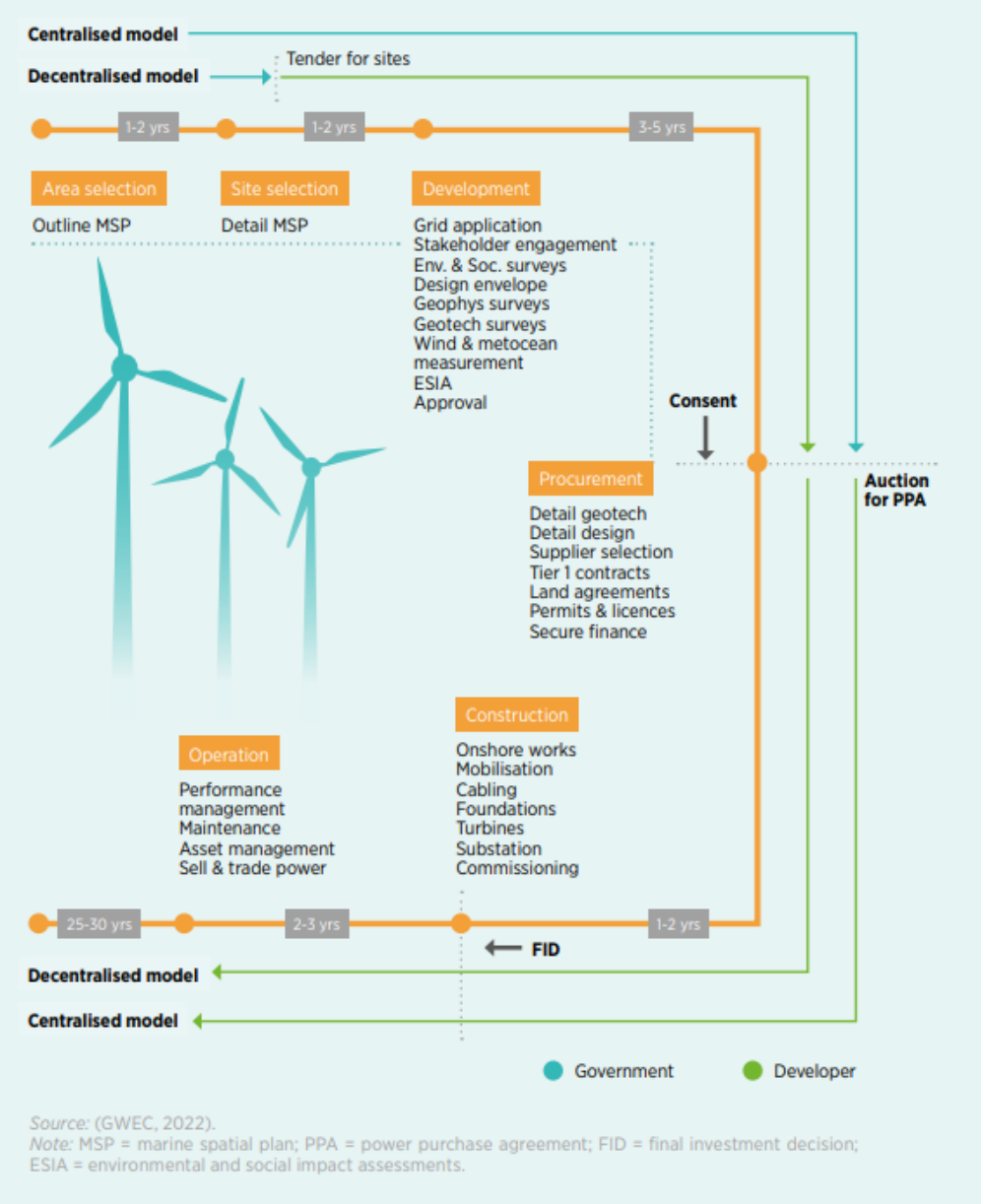


Figure 12 General schematic of the process involved in offshore wind permitting. [113]

It again quotes the Netherlands as an example of a centralised model, while the UK is the model used for the decentralised system. The USA is a country that uses a hybrid model, but it has to be like that with both State and Federal governments are involved.

As IRENA and GWEC worked closely on this area you would expect to see little difference in their reports. GWEC does talk about Leasing/Licencing and permitting as separate topics. They define the term **Leasing as encompasses the contractual process of granting seabed rights for offshore wind development and operation**. In Ireland the National Marine Planning Framework, published and passed in the Dail December 2021, defines Irelands marine area and, and this was covered by the new planning regime set out in the MAP Act also in 2021. The governments intent was to meet a requirement that GWEC mention as a key deliverable of the leasing process, with a centralised approach.

Leasing processes are overseen by the designated seabed authority. While approaches vary depending on the market, they are procedurally based on a framework that is adapted to national

preferences. Leasing terminology varies between markets; 'leasing' is also often referred to as a 'concession'. A well-executed leasing framework must ensure a steady pipeline of projects and aim to attract the participation of experienced actors (suppliers, investors, developers) to the market. These actors will bring valuable expertise, resources, and extensive market knowledge to develop successful projects and be key facilitators in the global expansion of the offshore wind sector. So far to date we have seen a wide range of interested parties in the Irish market with many of the leading players involved.

Like the IRENA report, GWEC puts forward the need to the establishment by government of the MSP will significantly enhance an efficient rollout of offshore wind installations. It is also addressing the management of the marine space as well as the upstream environmental and social considerations. Again, it references early engagement of all stakeholders as another key requirement. [98]

It captures this nicely in the following figure:

Figure 13 Leasing Framework Milestones GWEC Report 2023 [98]

Leasing framework milestones:

1. Raise the political priority of climate action by legislating national climate targets that account for offshore wind sector growth, e.g., developing a national offshore wind strategy.
2. Conduct pragmatic and proportional MSP to designate suitable areas for development with high wind resource and management of potential stakeholder conflict.
3. Establish leasing authority.
4. Determine preferred approach to leasing and revenue support.
5. Put into place relevant legislation.
6. Implement first leasing.

It would be an opinion that has been address in Ireland legislative framework and the structure is in place. **Resourcing of the structures is another matter**.

A last point worth noting is that the report sets out the following - that offshore wind flourishes in an environment with long-term system planning, and where policies and regulations are aligned to deliver clear objectives. Does the Irish system now deliver that?

The GWEC and IRENA reports talks about a number of countries emerging into this arena and what processes are the adopting towards Leasing, and as reference there is some valuable information in the report, but not delved into here any further.

Following its discussion on Leasing it goes on to cover the area Permitting, which they say can be quiet a long process. A typical project of offshore wind can take typically 9 years, but much of that time is in permitting. When talking about permitting we are talking about planning permission and

ensure that in Irelands case, it has a robust and manned process. The report says that if it is done right, permitting can unlock significant amounts of offshore capacity. The issue across many countries is the lead time. Under the EU's RePowerEU plan it calls for renewable energy projects permitting to be ''drastically accelerated''. [117] A provisional agreement was made on March 30th, 2023, to allow 3 years for permitting of offshore wind installations. In their designated ''acceleration areas' it can be as low at 1 year. Time will tell if this is the way it falls out in Ireland though time stipulations are being made now in the new planning act to be discussed later.

It points out that the UK has being trying to shorten its permitting time. In June'23 it announced an Offshore Environmental Improvement Package (OWEIP) to support accelerated deployment of offshore wind by reducing consenting time. They use a concept of a One-Stop-Shop (OSS) – a single point of contact in a lean process. It is also used in Demark and the Netherlands. It is a concept that possibly needs to be used here in Ireland. That said the process in Demark has been suspended as they feel it infringes on EU law, so all is not straight forward.

The one-stop-shop is being adopted across the world and the study mentions some European countries but also Costa Rica, the Philippines, South Korea, amongst others.

In looking at MARA/APB it could be assume that this is a similar model to the OSS with all matters pertaining to permitting going through MARA.

Permitting and leasing are totally intertwined and the IRENA report treating them as one is an understandable approach.

IRELANDS ELECTRICITY GRID – WHY EIRGRID IS TAKING THE LEAD

EirGrid is the Transmission System Operator (TSO) in Ireland and, working with System Operator for Northern Ireland (SONI), they look after the entire Ireland grid. It is a view that EirGrid has been very influential in the government's decision to follow the direction of a plan-based process for the development of Offshore Wind in Ireland. It is worth noting a few points.

The grid in Ireland is going through major change with the retiring of a number of fossil fuel burning sites in line with the climate actions being adopted. It will have a lot less conventional generation plant on the grid with the advent of increasingly renewable sources being brought online. This transition to low-carbon and renewable energy will have widespread impact on the power system. The electricity consumption from a changing society looking at heat pumps, electric vehicles (EV's) and the increasing demand from industry including a growing data centre population will see a demand increase for energy at a time of the change in generation sources. In the EirGrid Groups document All-Island Generation Capacity Statement 2021-2030 and their Ireland Capacity Outlook 2022-2031 [58] they discuss the need to have 70% of the energy on the grid to be provided from renewable sources by 2030.

They predict a challenging outlook over the next 10 years, with old fossil fuelled sites retiring, dealing with new renewable sites coming on line and the need to modernise and re-enforce the grid to deal with these changing generation sources. ''They say that in the short term the deficits will increase due to the deteriorating availability of power plants, resulting in their unavailability ahead of intended retirement dates.

In later years, the deficits are expected to reduce as new capacity comes forward through the SEM capacity auctions. Our analysis for Ireland and Northern Ireland shows that further new electricity

generation will be required to secure the transition to high levels of renewable electricity over the coming decades.''

A balanced portfolio of new capacity is required, and this includes the need for new cleaner gas fired generation plant which are renewable gas ready, especially at times when the wind and solar generation is low. This balanced portfolio is also crucial to ensuring Ireland meets its carbon budgets between now and 2030, which positions the electricity sector to be able to achieve the zero net carbon target by 2050. Furthermore, by 2030 there will be significant new additional load from the heat and transport sectors as they are electrified, in line with government targets set out in the Climate Action Plan 2021. ''

So, the safety valve for the grid will be new gas generation plant but they will be able to take fuels such as hydrogen when it is available, but initially will be powered by LNG. Some plants that were awarded contracts have not materialised and some plant are retiring early, and when combined with the advent and need to bring renewable energy sources online, the grid needs to be managed carefully.

As well as dealing with both onshore wind, and solar farms, looking for connection to the grid, this chart shows that the expectation for offshore to come on stream starts in 2028. In its 2021 report EirGrid said that it had a fully dispatchable plant capacity of 7,313 MW's while onshore wind

At year end:	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Wind Onshore*	4480	4630	4790	4940	5100	5250	5400	5550	5700	5850
Wind Offshore*	25	25	25	25	25	25	725	2865	5000	7140
Small Scale Hydro	26	26	26	26	26	26	26	26	26	26
Biomass and Biogas	24	24	24	24	24	24	24	24	24	24
Biomass CHP	30	30	30	30	30	30	30	30	30	30
Industrial	9	9	9	9	9	9	9	9	9	9
Conventional CHP	129	129	129	129	129	129	129	129	129	129
Solar PV	167	333	500	667	833	1000	1167	1333	1500	1667
Total	**4890**	**5206**	**5533**	**5850**	**6176**	**6493**	**7510**	**9966**	**12418**	**14875**

Figure 14 Partially/Non-Dispatchable plant in Ireland [58]

generation capacity was over 4,500 MW's. But the former is declining, due to emissions requirements so the amount of renewable power generation grows as a proportion of the available load.

The effect of renewables on the grid can cause entropy or turbulence on the grid. Renewable sources are asynchronous generators. These are being added to the grid which has been designed and built around synchronous electricity generator plant. Synchronised generators cause inertia which helps to stabilise the grid, which you do not necessarily get this with renewable sources. Inertia in power systems refers to the energy stored in large rotating generators and some industrial motors, which gives them the tendency to remain rotating. This stored energy can be particularly valuable when a large power plant fails, as it can temporarily make up for the power lost from the failed generator. System strength is an electricity grid's ability to maintain a steady voltage waveform. System inertia is its ability to maintain a steady frequency. Electricity grid security and reliability needs both system strength and system inertia under all network conditions, no matter the source of generated power.

With this growing mix of generator sources, as the level of asynchronous generation appears on the grid, it is necessary to limit the System Non-Synchronous Penetration (SNSP) on the grid to ensure safe operation. SNSP is a measure of the non-synchronous generation on the system at an instant in time. It is the ratio of the real-time MW contribution from non-synchronous generation and net HVDC imports to demand plus net HVDC exports, according to EirGrid. In lay man terms it means that has to be a balance struck between the two and the grid needs to be re-enforced to be able to tackle this changing source of generation. The target is to get the grid to be able to take a 95% penetration of renewables onto the grid. That will take time.

The other key point as to why the grid has a lead in the producer-led aspect is that these high MW projects cannot just connect anywhere the grid without causing significant issues. The entry point needs to be capable of accepting the load and not causing the grid to fall over. The obvious points of connection are where pre-existing/ retire power stations existed, but these are not numerous and typically in land, excluding Moneypoint. The infrastructure to these loads has to be built and connected to the grid. This takes time and needs to be done in a planned and orderly manner. The ability of EirGrid to be able to work in unison with the relevant government departments on the locations of new sites, is critical and essential.

As an example, the NISA project will make landfall just north of Balbriggan, Co. Dublin, but its connection point is in Belcamp, in Coolock, where the capacity is entry point is available, some 36 km away, and a lot of roadworks to be done. Meanwhile Codling Farm of the coast of Wicklow will be connected in at Poolbeg in Dublin as it needs a point to take 1.2 MW's when fully operational. These sites were developer led initially, and the solution to the connection points is disruptive in many ways. If plan-led, as it is from Phase 2.1 onwards, EirGrid will be designating the landfall and connection points and will thus influence the location of the future offshore windfarms, and at the same time focussing resources in that area to ensure that the grid is robust and re-enforced to take the new loads.

In summary, the fact that EirGrid, it seems, influence on the current strategy has merit as the grid will need to be planned, re-enforced, and built out in many places, to ensure it is capable of taking these new energy sources and that the entry points to grid are positioned correctly to take the load being generated. The ability of the grid to remain stable while accepting an SNSP of 95% is essential to our ability to provide a constant supply. The other factors like battery farms, interconnectors, renewable powered gas turbines, etc are all elements of the structure of the grid so it needs to be managed and EirGrid are best positioned to do so.

CONSENT PROCESS IN IRELAND

The **Maritime Area Planning Act, 2021** is the **key primary legislation** which establishes the framework for the maritime consenting process. [118] The National Marine Planning Framework was published concurrently with the MAP Bill. This bill is the new legislative framework for forward planning, development management and enforcement in Ireland's offshore area. The NMPF will be a part of the new regime and will be a key part of the decision-making process, and it is the national plan for Ireland's maritime area and is the equivalent of the National Planning Framework onshore.

Enacted in December 2021, the main provisions of the MAP Act relate to:

- Forward planning
- State consent – Maritime Area Consent (MAC) (Initially Department of Energy Climate and Communications then Maritime Area Regulatory Authority)
- Planning Consenting. Development management (ABP)
- Licencing of activities
- Enforcement (via the new agency (MARA) who in the medium term will have responsibility of MACs)

What is the process now to be followed – The **Consent Process** from Phase 2 Onwards is best summarised in the below table.

	Action	**Owner**
1	Marine Area Consents (MAC's)	Maritime Area Regulatory Authority (MARA)
2	Offshore Renewable Energy Support Scheme (ORESS)	Department of Environment, Climate and Change (DECC)
3	Once MAC issued a developer will be eligible to apply to ABP for pre application consultation (PAC) and design flexibility and consultation can commence	An Bord Pleanala (ABP)
4	Followed by a full application for planning on closure of pre-application consultation and receipt of a design flexibility opinion from ABP.	ABP
5	If ABP determines, that notwithstanding a negative conclusion in the Appropriate Assessment they have undertaken, that a project should progress and avail of the specified derogation provisions of the Habitats Directive for Imperative Reasons of Overriding Public Interest (IROPI), ABP shall submit a Statement of Case on the project to the Minister and ABP will determine the project in accordance with the Minisiterial recommendation.	Minister for Department of Housing Local Government and Heritage (DHLG&H)
6	Enabling Infrastructure: Grid Connection – only commence after planning consent has been received from ABP (including successful Judicial Review)	EirGrid
7	Regulatory – assessment and approving applications for licences to generate and construct	Commission for Regulation of Utilities (CRU)

Figure 15 Consent Process Steps

Note: The decision around any enabling port will be made as part of the developer's assumptions, but it is not part of the permission sequence.

Just to note that for the ORESS 1 auction and acknowledging the work developers had done, the process not plan-led but developer-led. To participate in the auction the developer had to get a MAC, participate in the ORESS auction, and then proceed with its application under MAP. The process detailed above has changed to the new norm for sites going forward.

In ORESS 1.0 there were two unsuccessful sites and there was a provision for an unsuccessful site to secure a corporate power purchase agreement (CPPA). The window of opportunity was very tight, and the two sites have until June 2024 to secure an alternative route to market. [119]

Putting this flow into a now familiar format, Figure 14 shows this flow.

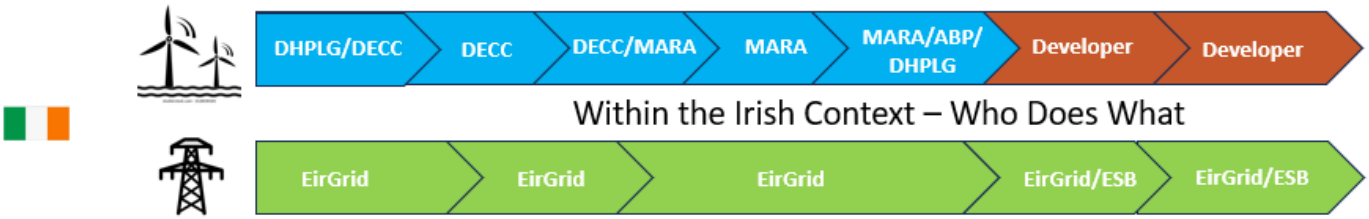


Figure 16 Consent Process Flow

TIMELINES

What is not clear is the associated timelines on the various stages of the permitting process and when trying to examine the expectation around meeting the required dates to meet Irelands obligations, it is difficult to full appreciated how long it will all take. National Marine Planning Framework (NMPF) does advocate the fixing of these timelines for the various stages, and this is time will come to pass.

A Clark Hill paper reviewed called Offshore Renewable Energy Projects in Ireland [118] comment that the process has two separate parts. Both parts are integral to one another and the first relates to licensing, planning, environmental and financial aspects for individual projects. The second one relates to the energy side of the project, the auction process, and the grid connection. But they are totally intertwined. A project needs to be able to find a pathway through both to be successful and to ensure minimal disruptions.

Clark Hill summarises nicely the various aspects of the process:

Headline Objectives of the Maritime Area Consent (MAC) Stage

- Management of maritime space conflicts
- Assessment of financial and technical capabilities of project promoters
- Public interest considerations
- Protection of State's property interests
- Consent portfolio management.

Headline Objectives of the Offshore Renewable Energy Support Scheme (ORESS)

- To support sustainable and stable electricity prices over a medium term
- To promote competition in the offshore renewable energy sector
- To enable an orderly process for connection to the grid network

Headline Objectives of the Planning Consenting Stage (ABP)

- To allow case specific environmental assessments
- To ensure compliance with the principles of proper planning and sustainable development
- To allow public and stakeholder participation

Headline Objectives of the Grid Connection Process (EirGrid)

- To ensure an orderly process for connection to the grid
- To ensure that the network has adequate capacity for connections. [118]

What is difficult is to see the timelines as mentioned previously, but the intent of the NMPF to address this as part of the new process. As there are **risks and potential delays throughout this new process** particularly as it is a new statutory consent process. Delays can mean the inability of the government to meet their obligations. Clark Hill's briefing document goes on to discuss the potential areas of concern which include costly appeals, judicial reviews, and also and in particular lack of resources are all set to derail government targets for offshore wind.

Without repeating verbatim what Chark Hall say, they note the delay in the Marine Protection Areas Bill 2023, was published in December 20222 and it is drafting and due to be published in early 2024.[120] It was due earlier in 2023 and is now out to 2024. These delays do not help progress. There might also be issues with a future review planned on the Offshore Renewable Energy Development Plan (OREDP). They also point out that they surmise that the first decision dates from APB will likely be a minimum of 2 years. They also speculate that each planning decision will likely have to go through a judicial review post an ABP decision. These could take, up to 18 months and if sent to the European Court of Justice this can take 1 to 4 years. They reckon that each application will be subject to judicial review. Based on this uncertainty, no Financial Investment Decision (FID) can be made till the project clears all these hurdles. Further potential delays in the actual implementation of the project – supply chain, vessels, ports, etc., were also mentioned but these will be looked at elsewhere.

The ORESS 2.1 Indicative Roadmap published by DECC in November 2023 paints a slightly more optimist view around timelines involving judicial reviews, but it is still only indicative. Wind Energy Ireland welcomed the timeline and said 'This roadmap is a positive signal for the continued development of Ireland's offshore wind industry. It will provide project developers and the offshore wind supply chain with greater certainty on the steps and timelines to deliver the next auction process.' [121]

ORESS 2.1 Indicative Roadmap

		Scenario 1 DMAP pre-summer	Scenario 2 DMAP pre-summer + JR	Scenario 3 DMAP post-summer	Scenario 4 DMAP post-summer + JR
Spatial planning	A: Draft South Coast DMAP published	March 2024	March 2024	April 2024	April 2024
	B: Final DMAP adopted by Oireachtas	June 2024	June 2024	September 2024	September 2024
	C: Judicial Review Window closes	August 2024	August 2024	November 2024	November 2024
	D: Judicial Review process concludes	N/A	February 2025	N/A	May 2025
Pre-Survey	E: Geophysical Survey undertaken by Marine Institute on behalf of DECC	April 2024	April 2024	April 2024	April 2024
	F: Publication of Raw Survey Data	June 2024	June 2024	June 2024	June 2024
Grid	G: Phase 2 CRU Grid Access & Charging Decisions/Positions	Q3 2024	Q3 2024	Q4 2024	Q4 2024
	H: EirGrid Publish Phase 2 Connection and Charging Information	End-Q3 2024	End-Q3 2024	End-Q4 2025	End-Q4 2025
MAC and ORESS	I: ORESS 2.1 Industry Information Session	January 2024	January 2024	January 2024	January 2024
	J: ORESS 2.1 Publication of Draft Terms and Conditions	March 2024	March 2024	March 2024	March 2024
	K: ORESS 2.1 Publication of Final Terms and Conditions	June 2024	June 2024	September 2024	September 2024
	L: ORESS 2.1 prequalification (with MAC materials)	October 2024	March 2025	February 2025	June 2025
	M: ORESS 2.1 qualification and auction (provisionally successful applicant proceeds to MARA MAC assessment)	November 2024	April 2025	March 2025	July 2025
	N: MAC Assessment by MARA, Award of MAC and ORESS Letter of Offer	February 2025	July 2025	June 2025	October 2025
Site Investigat	O: Site Investigation Licence Award	May 2025	September 2025	September 2025	January 2026
	P: Post Auction Project Developer Surveys	2025	2026	2026	2026

Figure 17 ORESS 2.1 Indicative Roadmap [122]

Much of the points made around the potential challenges are speculative but based on knowledge of the systems in Ireland Clark Hill speak with some certainty on their expectations. As MARA is only in the process of being structured, it is unknown what issues lie here. The point being made is that without the MPA Bill 2023, mentioned earlier, MARA is open to judicial review around marine protected areas. The bill being enacted will lead to more certainty.

Clark Hall also points out that ABP is struggling with a backlog and is under resourced at present. A recent article in The Journal, talks about how a planning blockage is threatening Irelands onshore wind sites. ABP has not approved a single wind farm project submitted within the last 12 months. [123]. 'This planning blockage is making building new wind farms almost impossible and seriously threatening Ireland's 2030 emissions targets, which rely on delivering more onshore wind.' On top of this current backlog across all of its remits, the offshore wind projects are added, with a more bespoke skill set required, it presents a challenge for the agency. So as ABP is supposed to expand, it is critical that the requisite skill sets, and experience are sourced.

ABP's role in particular in ensuring that environmental concerns are addressed is summed up by Clark Hill in saying ''The delay in identifying environmentally sensitive areas under the relevant EU Directives and domestically transposed environmental legislation relating to Special Areas of Conservation, Special Protected Areas, and Marine Protected Areas will pose a significant hurdle for ABP planners assessing individual cases. The vacuum in terms of designations and the identification of "qualifying interests", habitats, and bird and animal species will create uncertainty and potentially serious planning and legal vulnerabilities.''[118]

They also identify Imperative Reasons of Overriding Public Interest (IROPI) as a recurring theme based on the Habitats Directive. It is an issue in other domains such as Scotland and other countries within Europe. The Government is aware of this challenge and is said to be exploring a twin track approach with addressing it in parallel with the planning application so that here is no impact on the overall timeline.

Some relief will come from the Planning and Development Bill 2023, which is making its way slowly through the Dail. This addresses a number of the concerns raised here on timelines, certainty, resources, etc.

NEW PLANNING AND DEVELOPMENT BILL 2023

The legislation currently passings its way to the final stages in the Dail, replaces the Planning Act 2000. It was described by the DECC Minister O'Brien as the 'cornerstone legislation for Irish planning for the coming decades.' [83] It attempts to make this latest version of the planning approach 'fit for purpose' and with its stated intent to identify reforms required to deliver key infrastructure in housing, transport, and renewable energy.

Key reforms include:

- Improved consistency and alignment throughout all tiers of planning.
- Significant restructuring and resourcing of An Bord Pleanála, which will be renamed An Coimisiún Pleanála.
- Increased certainty across the planning system through the introduction of statutory timelines for decision-making, included for the first time, for An Coimisiún Pleanála.
- New strategic ten-year Development Plans for Local Authorities.
- Reform of planning Judicial Review, including the introduction of a Scale of Fees and Environmental Legal Cost Financial Assistance Mechanism; improving access to justice whilst regulating excessive legal costs.
- New provisions for Urban Development Zones, underpinning key growth areas.

Does this address the issues raised by the Clark Hill briefing document? The government will claim that it will bring 'greater clarity, certainty and consistency' to how planning decisions are made and will make the system more user friendly.

It does address the issue of timelines – the key time periods will range from 18 weeks for appeals of decisions of planning authorities to 48 weeks for strategic infrastructure projects.[84]

The bill also sets out planned changes to the judicial-review (JR) process for planning decisions.

It proposes to remove the application-for-leave stage, to reduce time spent in court and legal costs, while it also limits the ability of applicants to bring amended grounds beyond those originally filed in their applications.

The new bill also requires all JR applicants to have "exhausted any available appeal procedures or any other administrative remedy available in respect of the decision or act concerned".

The attempt here is tighten and shorten the time period in the JR process but also to make it affordable if required. There has been a significant increase in planning-related JR cases at a time when there has never been greater urgency to deliver on, amongst others, renewable energy targets.

To support the work to be done by the new An Coimisiún Pleanála, the Department of Housing, Heritage and Local Government has commenced a significant review of **resources** for the planning sector. Since October 2021, the Department has agreed to 117 new staffing posts in An Bord Pleanála (ABP). As of 31st August 2023, 238 people are working in ABP (including Board Members). It is intended that when all the approved posts are filled, over three hundred people will be employed by ABP. This will represent a 50%+ increase in the overall agreed staffing at ABP since 2021. [85]

The Bill is currently before the Dail having been introduced earlier in 2023 and gone through updates and refinements. Once enacted it is seen as another tool to address some of the issues mentioned in the Clarke Hall paper, but time will tell.

NEW HIGH COURT PLANNING DIVISION

On the 11th of December 2023 a new division of the High Court was launched called the Planning and Environmental Division. The court will allow for specialisation in this complex area and allows for more 'robust and faster decision making and less requirements to read into various complex technical areas' as said by Mr Justice Barniville, President of the High Court. [124] It is hoped that this move will lead to simpler, more effective law – thus supporting planning and environmental decision-making, as well as investment. It will allow for expertise to be developed as this type of case which ''is usually document heavy, technicality heavy and EU law heavy.'' It will focus of dealing with cases efficiently and will have prescribed timelines, with a target to produce judgements with 2 months. Hearings will be confined, generally, to 3 days, which in the past could have stretched to 2 to 3 weeks. These along with other changes will hopefully address issues around time lines and potential delays in the judicial system.

It would be hoped that this dedicated court process will expedite legal challenges and shorten lead times. Time will tell.

Ports – the Key to Maximise Benefits to the Irish Economy

Ports serve as indispensable hubs in the ongoing expansion of offshore wind energy and the energy transition. They fulfil key functions in construction, operations & maintenance (O&M), and often in the landing and system integration of the generated power for instance by accommodating green hydrogen production facilities. To offer these services, ports need to invest substantially in infrastructure enhancements and expansions. While this presents a challenge, it also offers a unique opportunity for ports to actively contribute to the energy transition and grow sustainable business paths [7].

New port infrastructure is needed throughout Europe to support offshore wind and in Ireland we are no different. The above quote is from a study commissioned by the Netherlands Enterprise Agency to look at the port infrastructure in each of the North Seas Energy Cooperations (NESC) countries of which Ireland is a member. It concludes that because, as we have seen, 'that institutional development (policymaking, application procedures, governing body) is still in progress, the timelines are quite ambitious.' It also indicates that if Ireland wants to have its ports as hubs for the offshore programme in its own ports it will need investment of the region of €2-3 billion.

This is the background for this review, and we will examine why, without potentially state investment, Ireland will not benefit from this rollout as it should, but as we become dependent on external ports for rollout port capacity costs will rise and Ireland will not have immediate access to the required facilities.

Ireland moved from a position of being an early adopter Offshore Renewable Energy (ORE) with the installation of the 25MW's of wind turbines on the Arklow Bank in 2002, to a position where, even though the country has committed to reaching 5-7 GW target of offshore wind by the early 2030's, to where it seems unlikely that these targets can be delivered. Government intervention on funding in infrastructure, in the port's section, will be required for Ireland deliver on its immediate commitments.

The preparedness of Irish ports to support the rollout of ORE projects in Ireland shows up as a bottleneck to the delivery of the ORE Project. It is clear that Ireland currently **does not have the port infrastructure to deliver the programme as committed to by the Government.** While a potential solution can be seen for a self-contained Irish solution for the installation of fixed based turbines, floating wind turbines installation is a different proposition and has a longer lead in time. It is also technology dependent. Whether we can have the port infrastructure in place for the late 2020's is not as clear.

This is a pan European challenge centred on developing a funding model for offshore renewable energy ports and Ireland shares this problem. American supply chains are also challenged by suitably designed ports to facilitate the rollout. In fact, it is safe to say that ports are a key enabler for offshore wind projects to happen and without a solution it becomes a very expensive bottleneck and blocker.

A partnered approach, as seen with the Scottish government, has been used as solution where the port developers and the government working together on a strategic investment model to develop the port infrastructure and the supply chain.

In the Global Offshore Wind Report from 2023, by the Global Wind Energy Council (GWEC), it discusses the essential infrastructure and work force required to deliver Offshore Renewable Energy (ORE). 'Offshore wind needs grids, **ports**, transport corridors and supply chain facilities, as well as a skilled and trained workforce to build, operate and maintain wind farms. If these are not available,

- Are there implementation plans with reasonable support and planning **from government**? Do the plans include options for private investors to provide the capital?' [98]

Ireland sits very much in this area, and it is **not clear** that the ports in Ireland are on track to support the rollout of ORE, though there are some positive indicators, but the developments seem to be more driven by individual ports rather in a centrally plan-led approach by government. This is a concern.

Looking at the global situation GWEC see's targets on the delivery of Offshore Renewable Energy (ORE) not being meet and in particular in the area of floating wind. 'GWEC Market Intelligence predicts that – due to the higher cost of floating wind energy, current challenging economic and financial conditions, and supply chain bottlenecks in foundations and port facilities – only 10.9 GW is likely to be built globally by 2030, which is 42% less than the previous year's projection.' Fixed-bottom projects are not as affected but they too suffer from similar restrictions. It is this latter project type where Ireland's initial ORE projects has to come from.

In Ireland we can make a clear distinction when it comes to ports – ports to support the fixed solution and ports required for FLOW. Overlap of usage can happen but, in this review, they are grounds to form the view that based on port physical characteristics, there will be a need for different ports to suit the two types on installations. This is also driven by location with fixed-bottom sites/ports based on the east coast while floating will be mainly south-west and west seaboard.

Ireland is not alone in this predicament where the plans seem to outstrip the countries' ability to deliver in this sector. When it comes to ports Irelands traditional fallback is that we can use Belfast or some of the European ports to deliver our initial projects, but this assumption is not based on solid foundations as the European ports are tight on capacity as they try to deliver their own national goals and Belfast is very much seen as much a part of the UK's delivery mechanism and while it might be able to help there is no assurance that it will be available. [125]

The other factors such as grids, transport corridors and supply chain facilities are not being ignored. The national grid is something that is being driven by EirGrid and led to the government plan-led approach. The other two points are European issues, and we are part of the solution, but it seems that ports are a barrier to progress if not tackled and a solution found in the immediate future. The solution has to be in Ireland.

The GWEC study also found that over the last 12 months that there is a growing implementation gap between what governments targets are being declared at and the rate of actual annual installation. Ireland was a contributor to the November 2023 NSEC tender planning document and has held firm on the commitments made for 2030. It also has given visibility to the next **tranche of tenders** on into 2030 plus, along with an indication of the **construction** plan. It does not indicate the type of installation as in fixed or floating, allowing room for manoeuvre. [126] The unavailability of suitable port capacity is possibly one factor that contributes to this growing gap but is not the only one.

GWEC also now see FLOW as only contributing after 2030, but there is still a need to deliver fixed units. This gives some clarity of the prioritisation of the work that Ireland needs to do to deliver a workable port solution and which type comes first.

The ports will serve a vital role in the delivery of the offshore wind energy in Ireland. **Ports are in fact enablers to a successful rollout in offshore renewable energy.** They are central to the development of offshore wind. 'We can't build or operate offshore wind farms without using Ireland's existing network of ports and harbours.' According to the Irish Examiner, this presents a real economic opportunity for some of Ireland's coastal communities. [127]

The problem is that Irelands ports are not ready yet to meet the challenges set by the ambitious targets detailed by the government. The target for 2030 is set at, at 5GW plus 2 GW for non-grid purposes and 27 GW nationally for 2050. [110] In the recently released Climate Action Plan 2024 (CAP 2024) the target is slightly changed to at least 5 GW for Offshore Wind, with the 2 GW's now designated as New Flexible Gas Plant – which could be burning Hydrogen, but the hydrogen now, is not necessarily generated from FLOW. [56]

The recent consultation on a New Ports Policy brought a lot of these issues with Irelands ports to the fore. It worth using this consultation process to delve a bit deeper on why ports are so important and what challenges have to be met.

NATIONAL PORTS POLICY CONSULTATION

Just focussing on the recent consultation on the Review of National Ports Policy 2013. It was opened at the end of 2023, and it helped to give a focus on the issues that arise in this area. While this review and consultation was led by the Department of Transportation (DoT), there has been numerous aspects of ORE, which have been seen earlier in this work, being addressed through government strategies, policies, and legislation, to lay the ground work to ensure a robust ORE industry can be developed. A common thread in these is the need for a port structure to support Irelands climate change commitments.

All of these strands have an input into the formation and the delivery of a coherent, connected, and succinct policy document which when it comes to ports, the new National Port Policy. It is not due till 2025, and will need to blend the strands together, in a coherent policy document. But 2025 seems to be very late for the publication and formation of this revised policy. Does this indicate a lack of urgency on behalf of the DoT?

The Department of Transportation's (DoT) work on the National Ports policy it timely but needs to be completed quickly and efficiently. It affords them the opportunity to take a holistic view of the ability of the ports to delivery Ireland's global connectivity firstly and at the same time act as one the key delivery vehicles, in the form of Ports, for Ireland ORE deliverables. The policy needs to knit together all the requirements around the port deliverables. In the DoT's Statement of Strategy 2023-2025 [128] while the delivery of ORE is mentioned, the first requirement of Irelands port infrastructure is to deliver its primary role of ensuring connectivity with Irelands global trading partners and facilitate passenger movement. But ports also need allow the ORE industry to co-share the resources they have, to ensure that delivery of the governments ORE targets is achieved, and with the economic benefit accruing to Ireland. This can only be done by being able to use the ports on the island of Ireland. The new National Ports Policy should endeavour to set out a policy that is overarching and brings all these objectives together and maximise Irelands valuable port resources.

The Department of Transport, for its part, is also integral to this and makes the National Ports Policy so important. The new policy is opportunity to link the port policy of these strands together. The 2013 National Ports Policy does not address the ORE opportunity and the intent to include the Development of Offshore Renewable Energy in the new policy is welcome but needs to be done in a timely manner.

In the consultation documentation it states ''Following the completion of the assessment the Minister for Transport decided on a multi-port approach to the provision of the necessary port facilities.'' [2] This was based on a comprehensive report completed by IMDO called IPORES 2018, [9] and the challenge is that though the framework used is comprehensive, 6 years has passed since this report was published and the wind industry has made major strides in scale of the technology. This report is still being used as a reference document, but it needs to be updated.

An example is that the typical turbine size used in the modelling in the IMDO report was 10 MW whereas today a typically turbine is a 15MW unit used in the 3.2 GWs awarded in the ORESS 1 auction in 2023.

This is important as it effects the inputs to the design of ports and some examples of metrics that have changed - a 10 MW nacelle, including the turbine, weights 400t rising to 500t plus for a 15MW unit, while the diagram below shows that the rotor diameter have grown from 174m to 240m. Blades on the 10MW weight 35t each while on the bigger model can be up to 65t, all model dependent. This growth in dimensions has a direct correlation with the ability of a port to handle, lay down, lift, and unload and load vessels and possibly the draft of the vessels using the port with increased load. With a 25MW turbine currently being developed and 20MW turbines being trialled, the port facilities will have to be able to handle this growth, and the port should not be a limiting factor and thus future proofed now.

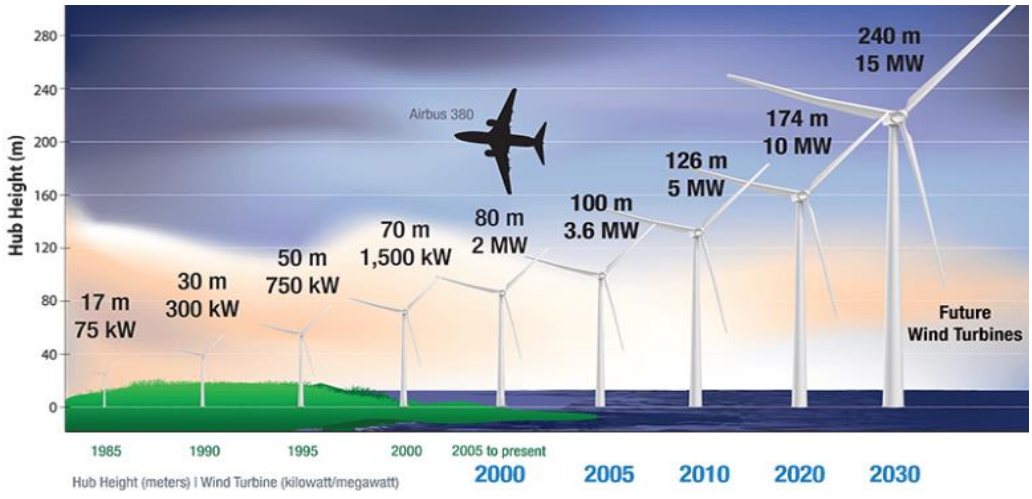


Figure 18 Wind Turbines are large and heavy and port infrastructure must be designed with area, space and capacity today to accommodate Ireland's renewable energy targets [7]

The volumes also used to model in the IPROES 2018 need to be redone in light of the accelerated requirement and review of the output needs to be used in decision making and policy development. A multiport model will be needed when the Operations and Maintenance factors are included, but a specialised and focus port structure will be required with accelerated investment into both fixed and FLOW installation ports.

Using a National Renewable Energy Laboratory (NREL) model as a template, the following would be indicative volumes that will be required to deliver the 7GW programme.

Table 1 Minimum requirements of Irish Ports to deliver 7GW offshore wind [8]

Requirements	5GW Fixed Ireland	2GW FLOW Ireland	7GW FLOW Ireland
Turbines/Nacelle	340	135	475
Foundations/Floating Platforms	340	135	475
Tower	340	135	475
Hubs	340	135	475
Blades	1020	405	1425
Fully-time Equivalents ave. annual workforce	2,000 to 8,200	800 to 3280	2,800 to 11,480

Assuming on average 15MW turbines used
Extroplated from an NREL document

The rapid growth of floating wind has accelerated greatly from 2018, when the IMDO report was completed. There would have been only circa 30 MWs of trial farms installed at that time. As of the end of 2023 there is now close to 200MW's installed, with some 240 GWs in the pipeline globally. Installations of 14MW turbines have been planned with the UK planning some 15MW turbine sites. The considerations discussed for fixed bottom are very relevant to FLOW, but added to this is the need to build these units at a port and store in a dedicated wet storge area is an extra requirement.

The consultation paper also refers the Port Capacity Study (2023) carried out by EY DKM ARUP, 2023[3], issued by the Department of Transport (DoT). It confirms in its conclusion that Ireland should have sufficient port capacity for all modes—RoRo, LoLo, Dry Bulk, Break Bulk, and Liquid Bulk—until approximately 2040. "If the planned developments are put in place in time, then the capacity will be sufficient to meet the forecasted demand in the highest growth scenario". **But the ARUP, 2023 study made no mention of the ORE industry** which is meant to co-exist at the same locations and overlapping on the resources of these ports. Once the scale of ORE is factored in, it is obvious that the ports mentioned in the Arup study do not have capacity for growth unless they are upgraded soon.

In any discussion on Irish Ports and the essential role that they will play in the rollout of offshore wind farms, there are many factors that need to be addressed in a port review. There have been a number of notable reports such as the National Port Study by Wind Energy Ireland (2022), IMDO IPORES 2018 study, along with Wind Europe 2030 Vision for European Offshore Wind Report (2021) and North Seas Offshore Wind Port Study 2030-2050 (2023), to mention a few. A common theme in all these reports in the necessity for ORE ports to have ample space and free access to the resources of the ports in question.

The North Seas Energy Cooperation, of which Ireland is a member, and the objective was to analyse the offshore wind port infrastructure needs in each of the NSEC member countries. The North Seas Offshore Wind Port Study 2030-2050 [7] puts in succinctly when it talks about the 5 key challenges for port development. The 4th challenge is listed as 'Competition for space'. It says that 'ports have limited space and a large demand coming from other (future) uses with more certainty, returns and clear requirements.' While the various reports mentioned above, set out the requirements for space and resources, the question that it raises is whether the practicality of the demands of competing activities been addressed and it should not be a core part of any new policy.

[3] https://assets.gov.ie/274073/b39b9cbc-d9f5-4ec5-aa13-01b90e105090.pdf

The 5 challenges for completeness' sake are listed in the figure below and they are relevant and should be part of the review requirements.

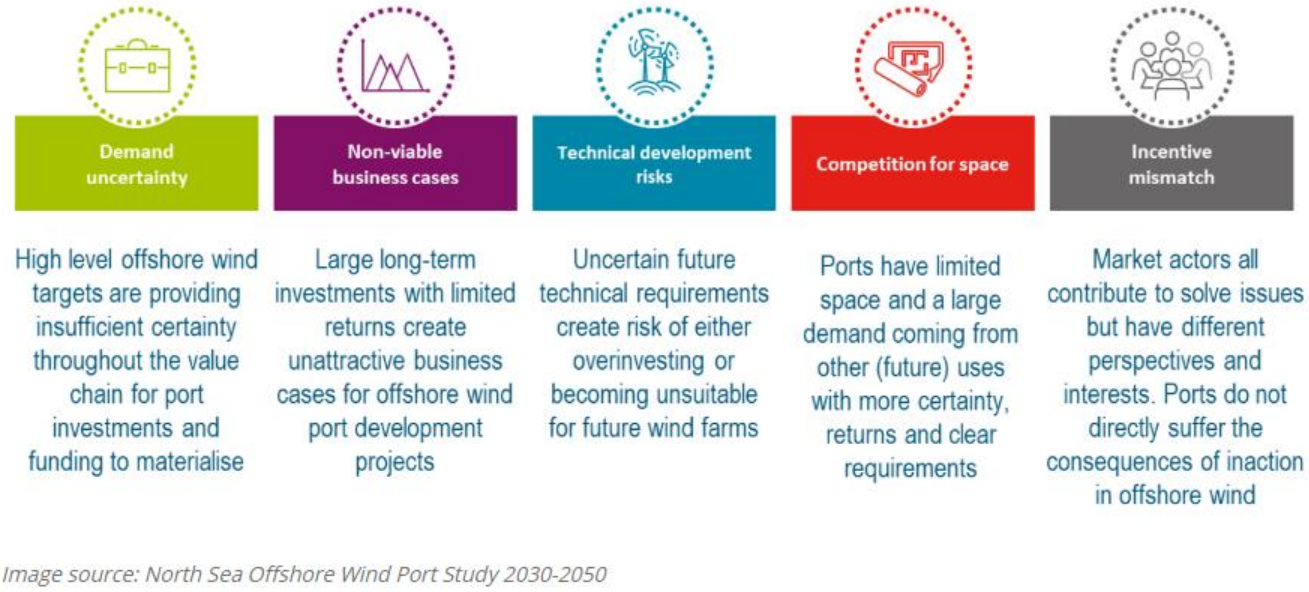


Figure 19 Key challenges for port development [7]

In Irelands case

1. **Demand Uncertainty** – should ports be available and with the publish schedule on what he intent of government wants to achieve, there is a certainty which should help the whole value chain.
2. **Non-Viable Business Case** – This a real issue and a challenge considering the current policy does not allow for state investment in ports. A port company will see a return in a business case in the short term from Lo/Lo or Ro/Ro but harder to demonstrate the return on ORE work.
3. **Technical Development risks** – as mentioned above this is a real concern and future proofing, and the cost of this, is a challenge. It is certain that equipment will bigger, longer, and heavier than it is today and the developers will want to scale up once the technology is available. There is risk but it can be mitigated.
4. **Space** – Space is a premium so the decision making around ports needs to factor this is and it will affect, particularly with FLOW, how to address the multiport scenario for assembly/manufacturing and installation and their special relationships.
5. **Incentive Mismatch** – This where a continuation of the plan-led approach will help and assist in the equalisation of all players and contributors to the project.

The report concludes the following with regards to Ireland ''Considering the timeline of the offshore wind ambitions, and the fact that institutional development (policymaking, application procedures, governing body) is still in progress, the timelines are quite ambitious. Significant investment is required for ports to realise these ambitions, with all large-scale plans indicating cost estimates of more than €100 million per site. Several locations have relied on funding from the EU's Connecting Europe Facility (CEF) to support the developments and, in June 2023, €11 million in co-funding was approved for Doyle Shipping Group in Cork and Irish Rail in Rosslare. In a study for the Dutch Embassy in Ireland, Royal HaskoningDHV (RHDHV) estimated that, **if Ireland wants to do all the main offshore wind activities in its own ports, a total investment of €2-3 billion would be required**.

If the focus is just on O&M and partial construction support, the investment needed is expected to be closer to €1 billion.'' [7]

It does welcome the Irish government initiative in the Development of a National Industrial Strategy for Offshore Wind 2023 and this current National Port Policy review, as an opportunity to pave a way forward in making use of the available port infrastructure and tackle the main issues with regards to port availability.

It is worth noting that if the investment is not made to the Irish ports the payback to the economy will not be realised until the work is done. **Belfast is the only port on the island that can support fixed bottom installations at this time,** [129]**, with the other option to use other UK or EU if available to us.** Considering these regions aggressive offshore plans, the question of available capacity would be an area of concern. It is also noted in this report that 150 nautical miles (278km) is the ideal distance of the port to installation field, though an ARUP paper talked about 200km (101 nautical miles) as a more ideal distance.[4] The economics of the project then comes into play. While Belfast is within this distance to cover the 3 sites awarded contracts in the ORESS 1 auction it could not service the west coast project.

Currently for FLOW there is potential to have this work done in the likes of Foynes and Cork, but this has not been realised yet. The need timeline is a few years away as of yet, but an informed plan-led, policy should address the requirement for the provision and of suitable ports to be developed.

The role of Irish ports and the development of Irelands Offshore wind industry are inextricably linked. So too is the success of the rollout of offshore wind to capitalise on the opportunity that must be realised to assist in not only de-carbonising Irelands energy infrastructure but also assist in exporting green energy to Europe in the form of both electricity and green fuels such as hydrogen helping to enable Europe's success in this area, as well as delivering major commercial value to Irelands economy.

Ports are the kernel of Irelands evolving ORE project and it is critical that ORE is given significant prominence, if the Government targets, as set out in its Offshore Renewable Energy Development Plan II, are to be realised [110].

Ports are central to the development of offshore wind. Wind Energy Europe put it succinctly when they said that ports play a key role for the local supply chain, logistics and supporting infrastructure (e.g., storage of components). Ports are where operation and maintenance of offshore wind farms are run, where all offshore wind turbines and other equipment get transported, and where floating turbines are assembled. And they will have a prominent role in the production and distribution of renewable hydrogen [130]. Within the European context the following infographics from Wind Europe captures the European potential.

[4] https://www.arup.com/-/media/arup/files/publications/p/ports-for-offshore-wind-the-net-zero-opportunity-scotland-ces-arup.pdf

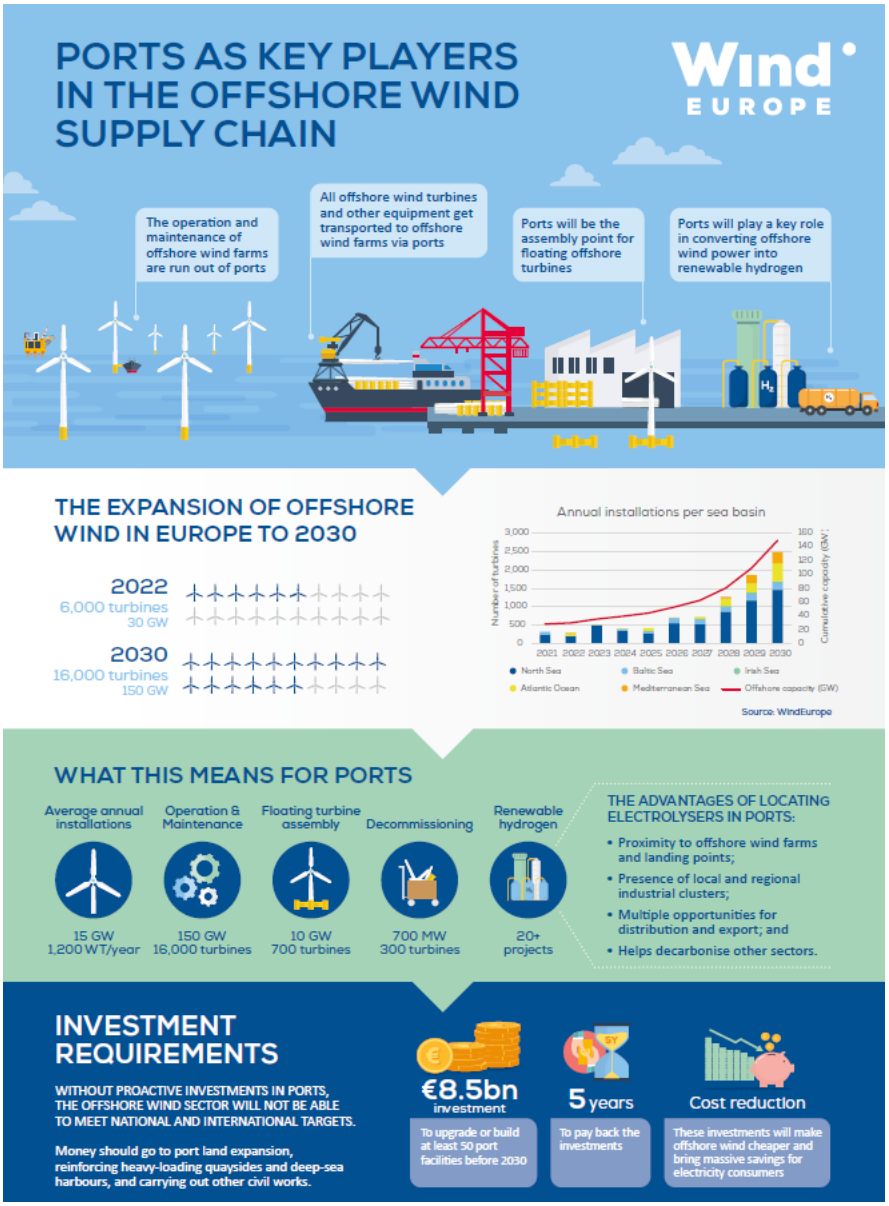


Figure 20 Ports support ORE supply chain, low-cost energy, the energy transition, jobs & economy [11].

Ireland plan of 7GW's is a 5% of the European plan but will require significant infrastructure sharing and port enhancements (some of which has already begun) within Ireland ports to deliver this ambition and reap the economic advantages of the fledgling ORE industry.

The previously mention NSEC Offshore Wind Report 2023 itemises the key challenges facing the Irish Port sector, while acknowledging the completion of this new Ports Policy, as follows:

- ► Currently Irish port capacity is not ready for expected size and scale in offshore wind
- ► Private ports invest on a commercial basis, uncertain demand is limiting investment options
- ► Support and funds are required to support Irish ports with their business case to invest
- ► Lack of regulatory framework for offshore wind, ports and hydrogen
- ► Permitting & consenting procedures need to accelerate [7]

The urgency around the delivery of Ireland ORE commitment was reinforced with the issuing by the NSEC in November 2023 of an indicative schedule (see below) showing Ireland delivery commitments. [131]

It shows Ireland commencing rolling out its ORESS 1 sites in 2026, with ORESS 2.1 following in 2028, and ORESS 2.2 in 2029. Can we ensure that are ports are ready to support this work or are we putting this work elsewhere?

It is worth also noting that the Department of Enterprise, Trade and Employment in its White Paper on Enterprise 2022-2030 [87], Statement of Strategy 2023-2025 [132] and its subsequent Public Consultation on the development of a National Industrial Strategy for Offshore Wind 2023 [86] sees the opportunity to develop a long term industry presented by ORE industry. The White Paper captures the opportunity as follows:

*The scale of our offshore wind potential, when coupled with hydrogen production, offers a **'once in a century'** industrial development opportunity as well as a high value export capability. It will not be simple to deliver but with the right policies, and industry buy-in, it has the potential to transform Ireland's economy. A proactive, positive industrial energy development approach will meet the needs of a rapidly evolving energy sector and the transformation of energy use by industry broadly. This will include developing a domestic supply chain and exportable expertise in renewable energy opportunities, including offshore wind and hydrogen. For example, Ireland could lead globally on the design, build and remote monitoring of floating offshore platforms and monitoring technology.*

To deliver of this objective, ensuring that our National Ports Policy can facilitate this, by maximizing what we in Ireland can do ourselves within the country and ensure that our ports can primarily deliver the connectivity that is required but also co-exist and thrive with ORE operating from Ireland own ports.

These targets would be reflected of the points made in the above mentioned GWEC report with CAP 2024 indicating that FLOW will move out beyond 2030. In the draft Offshore Renewable Energy Future Framework Policy Statement 2024 [88], as part of a recent consultation, it states that at the North Sea Energy Ministerial meeting in November 2023, Ireland agreed to procure 1.5GW additional offshore wind capacity by the end of the decade, comprising of 2 GW of non-grid-limited connected capacity and at least 9.5 GW of generation. It does not state that it will be installed by then, but you would have to assumed that this will be fixed-bottom units.

Just to put a perspective on this it and assuming that the developers will use a 15 MW turbine (tending to be the industry standard size), this equates to 634 turbine installations on the east/south coast. Based on the NSEC plans Ireland will looking to install some 1.5 GWs per annum, which in turn equates to 6 years of installation work for fixed bottom turbines. The window for installation is weather dependent so it equates to 8 to 9 months installation per annum, with a port possibly doing 50 units per year (conservatively). Based on the figures in the table below, Ireland would need a minimum of 2 ports able to support the installation process, from 2028 onwards, at the latest.

	GW	Fixed Turbines																	
ORESS 1.0	3.074	205	Fixed																
ORESS 2.1	0.9	60	Fixed																
ORESS 2.2	1.2	80	Fixed																
ORESS FF1	2	100	Fixed																
ORESS FF2	2	100	Fixed																
ORESS FF3	2	100	Fixed																
ORESS FF4	2																		
ORESS FF5	2																		
Total	15.17	645	Year	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	Total Turbines	Total GW's
			Fixed 1GW Rate					61	64	64	64	64	64	64	64	64	64		637	9.6
			Fixed 1.5GW Rate					61	64	100	100	100	100	100	13					
Ports Required		Capacity	50 Turbine Units PA/Port/1.0 GW					1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3			
		Capacity	50 Turbine Units PA/Port/1.5 GW					1.2	1.3	2.0	2.0	2.0	2.0	2.0	1.0					
Installation Rate GW's			Fixed 1GW Rate					0.92	0.96	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0			9.6
			Fixed 1.5GW Rate					0.92	0.96	1.5	1.5	1.5	1.5	1.5	0.195					9.6

Source of data - NSEC construction schedule (indicative) – November 2023

FF=assumed to be Future Framework phases - not designated fixed or floating

Turbine W 15000000

Source: DCU

A November 2023 report called North Seas Offshore Wind Port Study 2030-2050, by Royal HaskoningDHV for the Netherlands Enterprise Agency (RVO), looked at all the countries who are part of the North Seas Energy Cooperation (NSEC) group of countries. It looked at the challenges that are faced by all NSEC countries and in looking at Ireland in particular, it sets out the key challenges facing ports here. It states the following -

- Currently Irish port capacity is not ready for expected size and scale in offshore wind.
- Private ports invest on a commercial basis, uncertain demand is limiting investment options.
- Support and funds are required to support Irish ports with their business case to invest.
- Lack of regulatory framework for offshore wind, ports, and hydrogen.
- Permitting & consenting procedures need to accelerate. [8]

Let us expand these points and how it relates to Ireland. Looking at this points individually the following could be said –

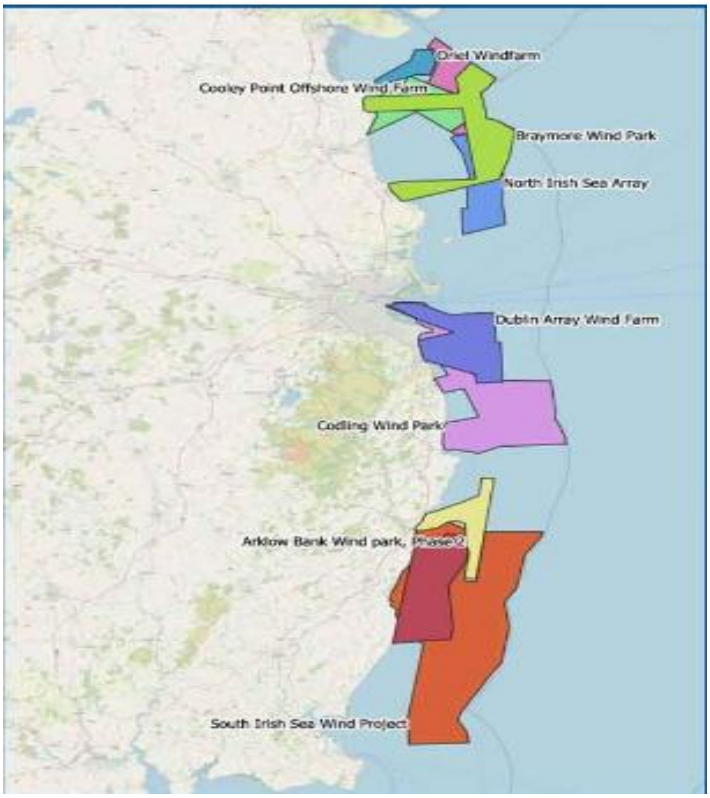
- **Currently Irish port capacity is not ready for expected size and scale in offshore wind.**
  As stated previously, and in particular for fixed bottom installations, which is the immediate requirement, the island of Ireland has no port outside of Belfast, that can support installations currently. The requirement is that the ports need to be on the East coast of Ireland, for proximity to the installation areas. Fixed bottom turbines are dictated by depth of water and the Irish sea, within Irish waters, is suitable for this type of installation. [133]

  Ireland had its first offshore auction – Offshore Renewable Electricity Support Scheme (ORESS) 1, in June 2023. There were 6 participants, 5 of these been on the east coast of Ireland. Three were successful while 2 did not make the mark.

  Successful bidders were Dublin Array, North Irish Sea Array and Codling, while Oriel Park and Arklow Bank were unsuccessful. The assumption is that in 2024, the 2 sites that who were not successful will be awarded contracts. CRU had agreed to pathway for these sites to get contracts but there was a deadline of 23rd of June 2024 to complete and to meet the necessary criteria. These two sites have a combined load of 1.175GWs. [134]

  The 4th successful site in the ORESS 1 auction was of the coast of Galway so it assumed that Galway possibly would be the port to support this site.

  The Braymore Wind Park (renamed Setanta Wind Park, 1GW), Clogherhead Windfarm/Cooley Point (now one project with potential of 0.8GW) and South Irish Sea Array (1.33GW) sites did not participate, and their status is unknown at this time. These have a combined capacity of 3.13GW.



East Coast Sites for Fixed Bottom Installations

Just over 3GWs was awarded in ORESS 1, [135], while the potential of the other two above mentioned sites is circa 1GW. The balance of the planned 5GW will come from DMAP 2.1, to be announced in Q1 2024 (up to 0.9GW) and the balance if required from DMAP 2.2. Both these DMAPs are on the south coast of Ireland.

Essentially the requirement to deliver this load will have to be supplied by east coast ports with still a potential of 3.13GW of projects commenced, as using fixed bottom technology.

Outside of Belfast, Rosslare, which is actively completing its submission for planning permission, and Bremore, a brand-new site which hopes to apply for planning permission by 2025, are the only two realistic sites to serve this 5GW load.

With regards to FLOW ports the timeline is longer before the requirement materialises, but it takes time and investment for a port to be ready for this type of project. Again, Ireland has no port available today for this type of activity. Cork and Foynes would seem to have the potential infrastructure and plan to be positioned to support this work.

In 2022 Engineers of Ireland flagged their concern with the ports situation in their paper 'Why the country must not miss the boat'. [136]

They say that ports play an integral role in offshore wind farm development, however, most of Ireland's ports (particularly those in the republic) are currently considered to be not well suited to service the offshore wind industry.

Recent legislative advancements and the setting out of a potential roadmap to achieve 2030 renewable electricity generation targets will, no doubt, accelerate the pace of offshore wind farm project development in Irish waters.

The establishment of adequate port facilities is on the critical path to facilitating unimpeded offshore wind development. Without adequate port facilities, an opportunity to develop a robust and indigenous supply chain for the offshore wind industry could be lost to overseas ports. As such, ports, developers, and the government will need to act quickly to identify, plan, design and implement port upgrades to avoid missing the boat.

Ireland has the potential to deliver but it is not there by any means as it stands. Rosslare can realistically get there in a relatively short timeline, but Bremore is still a 'blue' field site. Belfast is a possibility as are European ports, but that is a European solution and not an Irish one.

- **Private ports invest on a commercial basis, uncertain demand is limiting investment options.** The National Port Policy 2013 gave our ports a clear direction, placing their role firmly within a planning hierarchy in the policy and encouraged ports to develop master plans. The National Ports Policy 2013, and subsequently the Harbours Act 2015, facilitated the transfer of the five ports of regional significance, to more appropriate local authority control. In essence our ports are private companies operating on a commercial basis.[5] For historical reasons Rosslare is owned and operated by Irish Rail.

  Currently, throughout Europe, investment in ports for ORE is, often or not, a non-viable business case. WindEurope estimates that by 2030 Europe alone will need to invest €8.5 billion in its port infrastructure – a significant challenge, given that investments must be in place ahead of demand. [98] In the US the problem is also very real also. The Offshore Wind Market Report

[5] https://assets.gov.ie/274074/fba467e2-4371-46bf-982a-88b581a8772d.pdf

2023 says about $2.7 billion was invested in ports, supply chain, vessels, and transmission in 2022 in the US. While this work is done, the NREL still estimates at least $22 billion is still needed to be invested in ports, large installation vessels, and major manufacturing facilities in order to achieve the 30-GW-by-2030 target in the US. [137]

In business there is a requirement for a solid business case to be developed where return on investment can be seen, in order to raise funding. Royal HaskoningDHV would say that based on their study on North Seas Offshore Wind Report Study 2030-2050, [8], that a lot of the business cases for offshore wind port infrastructure are not viable as it stands.

About two thirds of the ports that have been involved in the stakeholder engagement process, in developing the report, have highlighted that they struggle with the development of a business case that allows them to invest or mobilise external funding to get projects off the ground.

"...The increase in component size will put pressure on the port infrastructure and risk of building a port that is obsolete in a few years..." [7]

The key point is the level of risk in investing in port infrastructure is key and it too high. As for most infrastructure projects, investments have a long duration, require a large commitment, and create a long-term financial exposure for ports.

As mentioned earlier schedules are slipping due to various constraints on supply lines, actual finance of the projects themselves and other deliver issues such as ships and equipment. With these unknowns there is a risk that specific investments, expose ports to a risk in overinvesting. The Royal HaskoningDHV report summaries the 5 major bottlenecks in the development of port infrastructure for ORE as follows:

1. Uncertainty about demand for port space: are NSEC countries converting ambitions into real projects? When will they implement these projects? There is currently too little clarity in Europe about the long term. This makes it difficult to secure investments and financing.
2. Unfavourable business case: the business case for the development of offshore wind ports is not attractive. Major long-term investments yield (too) little a return.
3. Technical risks: uncertainty about the technology required entails risks, such as excessive investments or unsuitable quays for future offshore wind farms.
4. Competition for space: ports have minimal space. There are also other parties that want to use the space which have clearer requirements and can offer ports more security and income.
5. A 'mismatch' of interests: delays in development of offshore wind port infrastructure do not directly affect the ports. It does, on the other hand, have major consequences for achieving offshore wind and climate goals.[8]

An example on the technology side this challenge is the race for size in turbines with a nacelle for 15MW turbine been circa 600t while a 20MW could be 1,000t. The length of the blades grows as the turbines grow.

In FLOW, the port requirement for a project involves a manufacturing port as well as an installation port. They can co-locate if there is space, but the manufacturing port is technology specific. Will a port be a manufacturing port with a steel or concrete manufacturing set up. The difference in weight of a unit is 4,000t versus 20,000t. There are a lot of moving parts as well as the changing national commitments on volume, which is trending only up.

The Royal HaskoningDHV report puts it as follows '*Furthermore, the investments needed for offshore wind are often quite specific in terms of requirements, dimensions, and assets. For example, the quay bearing capacity for turbines has to, preferably, be on a level of 15 tonnes / m2, while the expectation is, that with the continuous scaling of wind turbines, this will move into the direction of 25-30 tonnes / m2 and eventually even to 50 tonnes / m2. Moreover, the required laydown and storage areas, lifting capacity, wet storage and the access for installation vessels and floating turbines, creates an infrastructure demand that is often very specific for offshore wind, especially for installation and manufacturing ports*.'

The risk is you build something today that will be out of date before you finish, and this where there is value in a plan-led approach based on the best available information and also what is best for the economy.

As Irish ports are private companies, though ultimately owned by the state in most cases, finding alternative use of ports is probably a more attractive business case, other then ORE. Expansion to Lo-Lo or Ro-Ro may see a much quicker return on the investment. Within ports there is often a high-level of competition for space. Alternative use of port areas by traditional activities are currently more attractive than offshore wind related activities. Availability of space is seen as a huge physical constraint by ports, implying that they have to make difficult land use and investment trade-offs to consider the best option for scarce land. Since ports are often responsible for port development and investments themselves, the available funds are in short supply, and they have to be put to the best commercial, economic and/or socio-economic use.

Low and uncertain demand for ORE is another factor in the inability of ports to build a viable business case. Some certainty after ORESS 1 will help the east coast ports develop some plans based on the perceived installation schedules, but these are not locked down as of yet. Certainty and continuity of demand is difficult to forecast but in Ireland there is a scenario where that certainty can be given and that is possibly developing a government plan-led national approach.

Though only a brief comment on this matter, investment is key here and until there is sure return on the proposition, port infrastructure will be slow in emerging. Will this stop progress in Ireland?

An AECOM paper said that for port developers considering ORE, there is a further complication in the form of necessary return on investment. To recover the significant investment in port development, installation ports will need upwards of 10 to 20+ year revenue streams associated with leasing and terminal operation. However, ORE developers are typically interested in short-term (2-5 year) lease periods that are commensurate with the offshore wind farm construction or installation window. This leaves a big financial gap for port owners unless they can line up a series of developers that will commit to use the port's facilities over a cumulative span of a decade or more. Right now, few developers are willing to commit resources that far ahead, particularly given the limited insight into leasing rounds beyond 2025. [138]

For the 9.5/10GW that Ireland is looking to install of fixed-based turbines, as demonstrated earlier, it potentially is a 10-year programme divided between two ports. That said, potentially more installations may emerge of this type of unit and that life of the project can be extended. As surveying continues there possibly is more sites that can be used that are not currently under consideration.

A port can also be used as an Operations and Maintenance (O&M) plus these ports would also have a role in decommissioning and repowering of these projects, but the life of a typical

offshore windfarm project is some 25 years. Typically, O&M ports are separate but not mutually exclusive.

- **Support and funds are required to support Irish ports with their business case to invest.** Much has been written about the funding that will be required for Irish ports to grow and develop. In April 2023 Wind Energy Ireland in their paper 'We Can Build Them' explored in detail the various funding models and routes to finance for Irish ports. [139]

  Funding is a challenge, and the report summarises the challenges as follows:

  'Whilst several encouraging plans are in the pipeline for port development, funding has been cited as a key issue.

  The funding challenge is being exacerbated by the current economic headwinds, with inflation impacting material costs and interest rates at levels not seen for decades. This will serve to further increase funding gaps and reduce the commercial viability of projects, with increased scrutiny from lenders reviewing business cases for proposed projects.

  The expanded Ports Policy statement published in December 2021 cites the Connecting Europe Facility (CEF) funding as the main mechanism for funding port infrastructure supporting Irish ORE. Of the locations considered within the WEI National Ports Study, four had applied for funding in the 2021 call for applications. However, each of the Irish port applications were unsuccessful. It was hoped that the availability of European funding would serve to de-risk some of the upfront spending of the ports.'

  The report explores various mechanisms for funding and progress has been made since the report was written with CEF funding been received by some ports for preliminary works. Rosslare is a case in point. Rosslare was named the direct recipient in Ireland for the EU Connecting Europe Facility (CEF) funding on June 23rd, 2023. [140] The funding follows Rosslare Europort receiving a draft foreshore license to assist in its development of ORE facilities, in May 2023. Total funding required for the development of ORE at the port is stated as being €220 million.

  In the same announcement Doyle Shipping Group received €2.5 million in CEF funding 'for studies informing the consideration of the redevelopment and expansion of the existing port facilities in Cork, with a view to supporting the deployment of offshore renewable energy (ORE).' [141]

  While these allocations have been made, the funding models available to Irish ports, as set out the Ports Policy, are not conducive to build the port infrastructure for ORE. The 2013 Ports Policy set out that our ports should be freestanding commercial ventures with no state funding, and it has served its purpose. But as stated earlier, the model for investment in ORE ports is such that the approach must change, and state intervention will be required to deliver these ports, in some form. These are in effect national infrastructure projects, that require, again that phrase, a government 'plan-led' approach.

  A January 2024 report from KPMG says that 'The Irish ports do not have the revenues or balance sheets to deliver projects of this scale and the level of risk associated with the future ORE revenues makes private investment challenging, in particular in the early stages of the project lifecycle.

Funding from the CEF will play a key role in the delivery of these projects, but it won't bridge the funding gap on its own and it is by no means guaranteed. It would be reasonable to expect that once the projects reach a certain level of maturity, the risk profile will change, and these projects will be able to attract commercial funding from the market.

It is in the earlier stages of these projects that Government support and joined-up thinking is needed to get these projects underway. Whilst the investment required in the ports is sizeable, it is modest relative to the overall ORE and green economy investment that it will enable, and the ultimate long term economic opportunity for the State.' [142]

Bremore port project is an example of where state funding will be required to make this happen. Bremore would be the first new port built in the state since its inception. This project is a joint development between the semi-state Drogheda Port Company and the Ronan Group. According to the CEO of Drogheda Port Company, Paul Fleming, "Fundamentally, we do see it as being privately developed. But there are a number of elements we feel should be state funded. The link road into the project from the M1 we believe is a public good, much like access at other ports. Also, the breakwaters, a major part of the port, we consider to be a public good that perhaps the State should look in some way to supporting the finance of," he said. [143] Overall if and when completed it is a €1 billion project, but funding of port investment is very clearly stated that it does not support any infrastructural developments. Therefore, this is an issue!

Bremore is seen, by this research project, potentially as a key component in the delivery model of fixed bottom turbine installations within the Irish delivery model. No other port on the east has this potential within the Republic of Ireland. Fleming added that we are outliers in the European context, in that most European countries support key infrastructural elements of ports as being for the public good. He believes that if the policy does not change developments such as Bremore will not happen. If direct government investment is not forthcoming, then "government support in terms of European funding is another option for us". It is worth noting that Bremore will also address a capacity deficit for deep water port facilities as there is a looming capacity issue emerging with for example Dublin port nearly at capacity, as well.

Bremore project, originally muted back in the early 2000's as an alternate to Dublin Port, is in its current development phase since 2019 and is set to present a detailed planning application by 2026/2027. Public consultation has commenced. [144]

Rosslare Europort received a foreshore licence in May 2023 and has applied in December for Marine Area Consent and also has awarded its design contracts. Planning application is intended for submission to An Bord Pleanála in 2024. Construction is scheduled for 2025/26, with project completion anticipated in 2027. [145] [146] The Connecting Europe Facility (CEF), mentioned previously, is a key EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level, and the €2.5 million funding secured by Rosslare Europort will support the project's full design and planning application process, this year. [140]

There is a whole different piece of work around Floating Offshore Wind (FLOW) ports and their timeline is later then the fixed bottom ports, but not by much. Doyle Shipping was mentioned earlier in having received CEF funding as Cork is potentially one of the ports with FLOW potential. The Shannon-Foynes Port is also a port area that has considerable potential for delivering offshore projects of the FLOW type. It did receive CEF funding back in 2021. The CEF funding was awarded to support a feasibility study for future development of a new deep-water berth and

associated infrastructure. [147] This was more about developing infrastructure and connectivity with the deep-water birth, but this is the attraction of the port for FLOW projects. The greater port area has real potential. It is felt that the Shannon Estuary could support a build out of some 30 GW of FLOW, and house up to 2 GW of electrolysis capacity. [148]

Shannon Foynes Port Company have produced a Vision 2041 masterplan which lays out how if plans to become a FLOW centre. It is considered the best port to develop the supply chain for floating offshore wind, **a new deep-water terminal at Foynes Island and a strategy for the development of the offshore grid are critical** and should be in place by 2028 in order to enable the sector to mobilise and meet net-zero obligations by 2050.[149]

The challenge with FLOW ports is as much based on the structure of the floating platform for the turbine that will be installed in the Atlantic. Solutions to the question of the floating platform are not resolved but there are over 40 solutions out there is various stages of trials. In the Future Frameworks consultation in 2024, [88] a submission was made by this research work, and the contention made was that the steel solution offered by the consultants engaged was not necessarily the only solution, but also not the one that delivers the best returns to the Irish economy through jobs and contribution to the state. A manufacturing port for steel platform is quite different to the set up for concrete platform and has major input into the port design. In the UK there are numerous papers looking at the benefits to the concrete solution but did not seem to be consider by the consultants used, who happen to be from the UK. This will be discussed as a stand-alone subject later.

When it comes down to a funding scenario this uncertainty as to the requirements of the port for the future, makes it difficult to assemble a proposition. This again might be open to a government led/plan-led approach to be considered and set down some requirements.

- **Lack of regulatory framework for offshore wind, ports, and hydrogen.**

A review of the regulatory framework in Ireland was carried out in an earlier chapter but it is ever changing, complex and cumbersome. The review summarised the current situation as follows:

In taking a snapshot of the Irish Government's approach to its stance to the development of ORE, throughout its policies, strategy documents and legislation, it is evident that the need to have renewable energy sources is central to its approach. Attaining targets for greenhouse gas reduction and using renewable energy is seen as one of the key modes of delivery. Offshore wind is very much the untapped resource to date, but progress is being made with the support of the governments approach. A delivery timeline now exists and the relevant changes and updates to policy and legislation have been made or in the process of being made, which is hoped will remove barriers to delivery in a timely manner.

Alignment of COP and EU targets are stitched into the approach and from the review at a macro level, the building blocks seem to be in place to build an offshore industry that will not only contribute to the delivery of the environmental targets but also allow the offshore potential in Ireland to secure a new form of export from Ireland in the form of 'energy' but also maximise the potential for employment and financial stability for many years to come.

Time is not on Irelands side and legislative and legal bottlenecks are and need to be continuously addressed, but the legislative/policies/strategies infrastructure seems to be now or close to

being in place. Has it sufficiently been resourced is something that is still open, while changes to the judicial processes should also benefit the timeline for delivery. The coming few years will be critical for delivery.

To set the backdrop for this review of Government policy, it is clear that the advocacy for offshore wind is part of a global solution to promote a move to sustainable and renewable energy sources and away from traditional fossil fuel-based energy sources. This ultimately guides the framework that ultimately influences Irish Government Policy, Strategy and Legislation and attempts to show why the current Irish pathway has been chosen. The move away from fossil fuels, seen as the major contributor to Greenhouse gases and climate change, paves the way for the need to develop renewable energy resources. Offshore wind is one the key renewable energy resources.

There are some many moving parts to regulatory framework, and change is ongoing. The output from the National Ports Policy consultation, the draft Offshore Renewable Energy Future Frameworks Policy Statement, Powering Prosperity – Ireland's Offshore Wind Industrial Strategy along with the SEAI Offshore Renewable Energy Technology Roadmap are a recent quartet of documents that can be related back to aspects of port development. The Ports Policy threw up the issue that we discussed in the last section about the policy of not funding the state ports, but a bigger concern is that this revised policy will not be issued until 2025, which is over 12 months away. The revised ports policy will also need to align itself to the evolving energy policy such as would be required to support the Offshore Renewable Energy Future Frameworks policies where applicable to ports.

In the 2013 Ports Policy, there is no mention of ORE with its focus on the trading aspects of port activity. KPMG commented that 'For the ports to be taken seriously by investors, it is critical that a pipeline of ORE development can be seen in the region through clear and reliable plans, e.g., through the provision of Designated Maritime Area Plans (DMAPs) in all key development locations to enable Offshore Renewable Electricity Support Scheme (ORESS) auctions to take place.

As with all elements of planning, this process could be subject to delays by An Bord Pleanála for both the port and ORE developments. Therefore, increased marine planning capability and capacity will be needed over the next couple of years to manage the DMAP and ORESS process.' [142] This will equally apply to the planning around all future port developments, and they do not get unduly delayed.

The current Planning and Development Act 2023 is in the Dail since November 2023, and this will consolidate and revise the law relating to planning and development and has the potential to streamline the process and the timelines around planning applications. When it comes to both ports and the offshore projects, this piece of legislation will be key to modernising the processes involved. There is no clear timeline as to when it will complete, and this would be typical of the concern expressed in getting our legislation through in time to support the requirements of ORE.

The other issue that is common to the permitting topic discussed earlier, is the resourcing of the government bodies with not just people, but people with the required background to ensure that all planning and permitting matters are dealt with competently and speedily. There is a lot of new skillsets required in processing requirements around ORE and on port development.

The Maritime Area Regulatory Authority, or MARA, is a new state agency that was established on 17th July 2023. MARA's functions are set out in the Maritime Area Planning Acts 2021 and 2022, and it will have a key role to play in the new streamlined consenting system for the maritime area, and around port development. Mara is part of the Department of Housing, Local Government and Heritage.

Once you start discussing the governments work in this area there is myriad of policies, strategies, and legislation. Activities around the National Marine Planning Framework, which is Ireland Marine Spatial Plan, Maritime Area Planning Act and many more, you can see that an effort is being made to put the structures in place to support the ORE activity.

With reference to Hydrogen, The National Hydrogen Strategy has been published. [150] It links in the role of ports and says that 'Commercial ports will play an important role in facilitating the establishment of a hydrogen economy'. It also says that commercial ports will play an important role in facilitating the establishment of a hydrogen economy. Undoubtably green hydrogen is a significant output of ORE and the co-location of manufacturing on the gas at ports is recognised across many documents on the subject. This synergy between ports and hydrogen is very important but it needs space. As said before, space is at a premium. The Policy Statement on the facilitation of Offshore Renewable Energy by Commercial Ports in Ireland in 2021, highlights the significant role ports play in this area and that a number of ports facilities will be required for deployment activity, as well as ongoing operations and maintenance support of offshore renewable energy installations. [61]

In looking at port developments in European and some of the Irish ports, facilitating of hydrogen manufacturing within the port complex is seen as part of the requirement. Space is a premium but ports will be crucial in upscaling renewable hydrogen production and distribution, especially when linked to offshore wind generation. [7] Up to 42% of the EU's total hydrogen demand could be located in port areas by 2050 according to the Deloitte study. However, all stakeholders must work together to develop a long-term plan for investment in ports hydrogen infrastructure.[151] In planning port infrastructure allowance should be made for hydrogen production. As a guide 17 hectares is the space required for a 1GW electrolyser. [152] It is space hungry but for example Foynes and Breamore have both made allowances for it in their plans.

In summary a lot of positive steps have been taken to modernise our regulatory framework and it is trending in the right direction. The but is based around the timeline for the passing of legislation, approval of related policies and strategies. The other concern would be on resources and the populating of the planning process, be it in ABP or MARA with the qualifies people required and the numbers to meet the needs.

Finally, and worthy of note there is now a national level spatial strategy and is an important tool in setting out the overall framework and spatial strategy to facilitate the transition from a **developer-led approach to the enduring plan-led**.[153] This is a significant change in policy and within our discussions on various aspects of, for example Ports, the need for a government -led approach beyond the spatial strategy is evident. The government through its revision of the 2013 Ports Policy needs to adopt a plan-led approach to resolve the port infrastructure and take a lead role.

- **Permitting & consenting procedures need to accelerate**.

  In the earlier review of Permitting and Leasing, including Consenting the findings can be summarised as follows:

  It can be said that in Ireland permitting process as developed is untried, potentially under resourced and under skilled, combined with policy issues and slow progress with the legislation, potentially delays can be expected. It can be hoped that his matter can be addressed, and the corner turned, and with introduction of the new Planning and Development Bill 2023 it is hoped that progress will be accelerated.

  In the recent North Seas Energy Cooperation release, it paints an optimist timeline for the upcoming tendering process as of November 2023 and that 11.6 GWs of energy will be tendered by 2030 and that 12.6 MW's (an additional 1GW is tender after 2030) can be delivered plus phase 1 sites giving a total of 16.3 GWs before 20240. It indicates that the construction pf phase 1 projects commence in early 2026 and completes by 2031, while phase 2.1 projects commence construction in early 2028 and does not complete till 2033. The 2 GW of floating wind will not be available till late 2034.

  On phase 2.1 it is indicating that the tender decision will be late 2025 while the construction commences early 2028, allowing for 3 years for the permitting phase.

  The RePowerEU Council in 2022 recommended that EU countries need to accelerate their permitting process and deliver in their renewable go-to areas. It should not take longer than 24 months on offshore projects. In duly justified extraordinary circumstances the period may be extended by up to six months. [115] There is little evidence to date of Irelands adoption of this approach, but possibly the intent of the new planning bill will go some way towards addressing this.

  In the Climate Action plan 2023 [116] it spoke about the offshore energy potential in Irish Waters and how significant it was. In accelerating the delivery of this ORE, it places a lot of emphasis on the Offshore Wind Delivery Task Force and what they can do to meet the accelerated ambitions in the plan. Some of the objectives on the state-led consenting regime have been delivered as mentioned – MARA, MPPS, Marine Planning Guidelines, INFOMAR, but it is behind on the Marine Protected Areas Bill.

  In summary in 2021, according to Mr. Robert McGuinness, Director of the Offshore Wind Delivery Taskforce, the Department of Housing, Local Government and Heritage delivered the National Marine Planning Framework which laid the groundwork for all maritime activity to follow and a joint DECC/DHLGH effort delivered the Maritime Area Planning (MAP) Act shortly afterwards, completing overhauling and streamlining the marine planning system.

  In 2022, DECC developed the processes and awarded the very first Maritime Area Consents to allow the first offshore wind projects to progress to planning and auction. EirGrid Group and the Commission for Regulation of Utilities (CRU) developed the offshore grid code from scratch and DECC established the whole-of-Government Offshore Wind Delivery Taskforce to mobilise Irelands economy towards this opportunity.

  In 2023 the first offshore wind auction, ORESS 1, was held. It was a collaborative effort between EirGrid, the CRU, DECC and the industry (Wind Energy Ireland) to deliver the largest renewable

energy auction in the history of the State, at a highly competitive price that will shield energy consumers from price spikes for 20 years. Government also agreed the Phase Two Policy, which adopted the permanent move to plan-led system to maximise whole-of-society gains.

The Department of Enterprise, Trade, Employment and Enterprise Ireland launched the process to develop an Industrial Strategy for Offshore Wind, the Department of Transport secured Connecting Europe funding for offshore wind deployment ports, and in 2023 Irelands dedicated maritime authority, MARA, was launched, along with the first offshore spatial plan proposal (DMAP), an agreed protocol for engagement with the Seafood Sector, the ORESS 2 consultation, the Hydrogen Strategy - with the Marine Protected Areas (MPA) Act and an overarching Spatial Strategy still to come later in 2023 or early 2024.

So, from a task force perspective progress is being made. The taskforce also released the 'indicative roadmap' towards the State's next offshore wind auction (ORESS 2.1). This helps in the building of momentum following on from the first auction in 2023. Following feedback received through the ORESS 2 consultation, the roadmap has been drafted on the basis of an integrated MAC-ORESS process aimed at balancing the need to mitigate against speculative auction bidding, administrative efficiency, and Maritime Area Regulatory Authority (**MARA**)'s obligations under the Maritime Area Planning Act 2021. [91] The South Coast DMAP is expected by Q2 2024, along with the draft terms and conditions for ORESS 2.1, this maintaining momentum. Indications that there will be multiple development sites above that expected in ORESS 2.1. This indicates further potential for fixed bottom ORE sites. On the downside some legislation is late but, on the way, and once this is in place the outlook will be more favourable.

This area that is evolving and very much work in progress but trending in the correct direction of travel.

Finally, as we finish this discussion on Ports in Ireland, which has been a macro level discussion the diagram below sets out the question.

- **Will your port seize the offshore wind opportunity? But it should be broadened further and paraphrase to say Will Ireland Ports seize the offshore wind opportunity?**

[154]

Their diagram is from a report called 'The Role of Ports in Offshore Wind', says that the 3 key points are -

1. The huge opportunity for ports in offshore wind
2. Where the gaps in port infrastructure currently exist
3. How you fill those gaps with the right development

But let us add a fourth. When discussing Ireland as a whole a clear requirement and infrastructure model needs to be generated centrally and orchestrated to work with all the key stakeholders to deliver the solutions and funding model required to deliver a port structure to Ireland for ORE.

4. Can Government take the lead in a Plan-led approach to transforming our port infrastructure. This is a question of national interest.

PORTS ARE CENTRAL TO THE DEVELOPMENT OF OFFSHORE WIND.

They play a key role for the local supply chain, logistics and supporting infrastructure (e.g. storage of components). Ports are where operation and maintenance of offshore wind farms are run, where all offshore wind turbines and other equipment get transported, and where floating turbines are assembled. And they will have a prominent role in the production and distribution of renewable hydrogen. [155]

Every document produced by government on offshore wind starts about the significant potential of our offshore resources. Ambitious targets have been set in Ireland's exclusive economic zone: 20GW by 2040; and at least 37 GW in total by 2050. [88] This all part of Irelands commitment that the country will reach net-zero in advance of 2050. Delivering off shore wind farms is central to this and there are a lot of moving parts associated with this and here we look at the ability of ports to enable this rollout to happen. For Ireland to deliver on its commitments the port solution has to be found and Ireland is seeing the same issues across Europe and the US.

Ireland is part of an EU problem trying to deliver on its targets. Investment is required to build the ports there is not necessarily a viable commercial policy at play. Irelands 2013 Ports Policy does not allow government to invest in port infrastructure as they made all ports private companies. The capital outlay is great, requirements are changing and the payback later rather than sooner, so ports would prefer to invest in Lo-Lo or Ro-Ro rather the ORE! Paraphrasing a line from a Wind Europe report from last year but Ireland 'ports can only deliver those services if they make significant investments to upgrade and expand their infrastructure. Crucially, ports need to expand their land, reinforce their quays, enhance their deep-sea berths, and carry out other civil works. They need to do this to cater for operating and maintaining of a larger fleet (including training facilities), for upcoming decommissioning projects and to host new manufacturing centres for bottom-fixed and floating offshore wind. Ports also need to diversify their activities to support the decarbonisation of industries, transport and heating in coastal areas.' [155]

Over the coming pages we will look at what the key issues but when we discuss port requirements, what makes them different then standard ports. It may be obvious but not fully understood.

BRIEF OUTLINE OF PORT TYPE IN REQUIRED TO ENABLE OFFSHORE RENEWABLE ENERGY

When the subject of ports is discussed, one has to remember there are various types of ports required and an important distinction needs to be made between ports needed to support fixed-base wind installations and floating wind installations. These ports are not necessarily interchangeable but not mutually exclusive either. There would be a tendency that a port would be set up to do one type of installation or the other. Based on what the Climate Action Plan 2024 says it looks like FLOW is not envisaged until the 2030's and that could help the realisation of the ability of Irish ports to be able to support FLOW. [56]

To deliver Irelands ambitions in ORE ports are required to deliver both fixed and floating windfarms. Based on the stated plans by the Government we will be looking to deliver up to 5 GW of fixed bottom by 2030 so the priority to deliver the required infrastructure to achieve this. There are many excellent reports on the requirements for ports for ORE and it is not the intent of repeating this information, but there is no harm just doing some brief definitions of ports and what is required.

There are some common requirements for port modifications or new developments that are needed to accommodate offshore wind development projects.

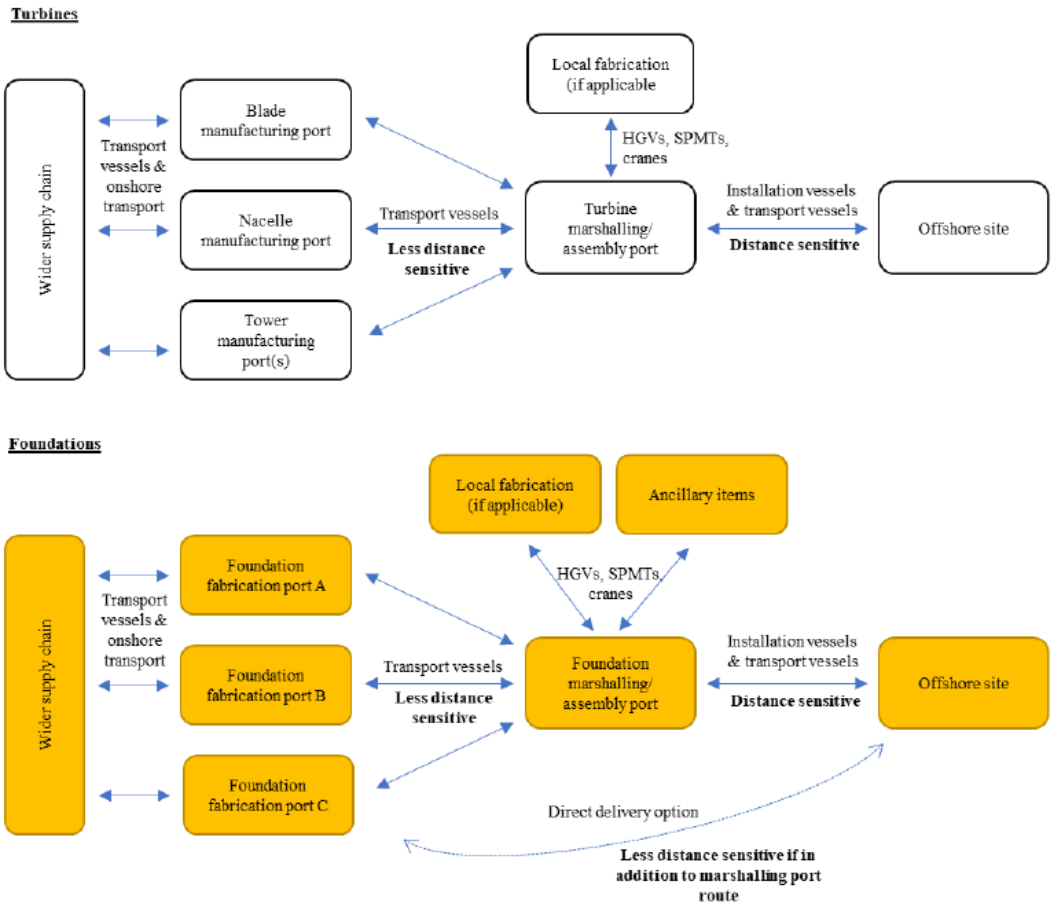
These include:

- Sufficient water depths and access channel width.
- Adequate quayside space and load bearing capacity.
- Land area for storage, assembly, manufacturing, and operations.
- Crane capacity to transport and lift components and integrate turbines within the port.
- Launch and wet-storage facilities.
- Manufacturing and assembly facilities for key components.

But the role of a port differs depending on the specific project and their role in the wider value chain. Fixed-bottom offshore wind and FLOW have different infrastructure requirements, and therefore place different demands on ports.[154] Royal HaskoningDHV go on to define the following for the two type of ports in general terms;

Fixed-bottom offshore wind Port - For fixed-bottom developments, ports act as marshalling and assembly hubs. Components like cables, foundations, transition pieces, towers, and turbines are often manufactured and sourced from locations across Europe – or sometimes further afield.

Per ARUP, a marshalling or assembly port is used as an intermediate facility during the construction phase of a windfarm. A marshalling or assembly port would be located relatively close to the offshore construction site and very likely closer than most of the project's fabrication or manufacturing ports. They are used as temporary storage or assembly locations for major components (such as foundation and turbine components) originating from different locations of original manufacture, before final collection for installation at the offshore site. Figure below illustrates the key concept role of marshalling/assembly ports relative to fabrication/manufacturing in an offshore wind construction process for the major turbine and foundation components. The figure illustration of ports in a typical offshore wind supply chain for the major turbine and foundation components. It is feasible for individual ports to fulfil multiple roles. Note that there is no standard model, and that all logistics processes are subject to the design and contractual arrangements of individual projects.



Source [28][6]

The table below is from WEI's 2022 National Port Study and addressed the parameters consider an installation of 750 MW-1,000 MW capacity. The requirements assume staging and marshalling of foundations and turbines only, cables are excluded and assumed to be deployed from another port location. Please note that an annual installation rate of between 50 to 66 turbines per annum, using 15MW turbines, mentioned earlier in the text.

[6] https://www.arup.com/-/media/arup/files/publications/p/ports-for-offshore-wind-the-net-zero-opportunity-scotland-ces-arup.pdf

Parameter	Unit	Minimum	Preferred
Access Channel Width	m	120	200
Access Channel Draft	m LAT	9	12
Quay Water Depth	m LAT	10	12
Air Draft	m	30	40
Quay Berth Length	m	200	300
Quay Berth Width	m	60	80
Quayside Bearing Capacity	t/m^2	15	>25
Jack-up Barge Suitability	Yes/No	N/A	N/A
Laydown Area (Turbines & Foundations)	ha	15	20
Laydown Area (Turbines Only)	ha	10	13
Laydown Area (Foundations Only)	ha	5	7
Laydown Bearing Capacity	t/m^2	7.5	>20
Welfare / Office Space	m^2	200	700

Source [133]

Developers will look for the best-equipped and most efficient manufacturing location for their specific project, often using multiple locations to secure and de-risk supply.

Once manufactured, components can be loaded directly onto a transport and installation vessel from the manufacturing port. Or transported to an installation port close to the project site.

Floating offshore wind Port - FLOW projects place a larger demand on ports than fixed bottom. Many components, like the large FLOW turbines and the floating substructures they need to stand on, will require an installation port once manufactured.

An installation port will need to handle, store, integrate, launch, and wet-store FLOW turbines before they are towed to their final location.

And the role of ports doesn't end once installation is complete. Operation and maintenance, monitoring, and repairs will be required throughout the asset lifetime of offshore wind farms.

These assets will need continuous monitoring, experts on site, inspections and small and larger repairs of systems, components, blades, and cables. For FLOW large component replacement are expected to be taking place in the port, requiring significant space in the port.

Parameter	Unit	Minimum	Preferred
Access Channel Width	m	150	200
Access Channel Draft	m LAT	9	15
Quay Water Depth	m LAT	9	15
Air Draft	m	Unlimited	Unlimited
Quay Berth Length (turbine staging)	m	300	600
Quay Berth Length (manufacture plus turbine staging)	m	600	900
Quay Berth Width	m	40	80
Quayside Bearing Capacity	t/m^2	15	50
Laydown Area (substructure assembly only)	ha	12	18
Laydown Area (turbine staging only)	ha	6	12
Laydown Area (manufacturing + assembly of substructures and turbine staging)	ha	34	50
Laydown Bearing Capacity	t/m^2	7.5	>20
Wet Storage Area (phasing assumes 10 substructures in wet storage at one time - stored without WTG Topside)	ha	30	70
Wet Storage Area (phasing assumes 10 substructures in wet storage at one time - stored with WTG Topside)	ha	80	280
Wet Storage Draft	m LAT	13	23
Welfare / Office Space	m^2	200	700

Source [133]

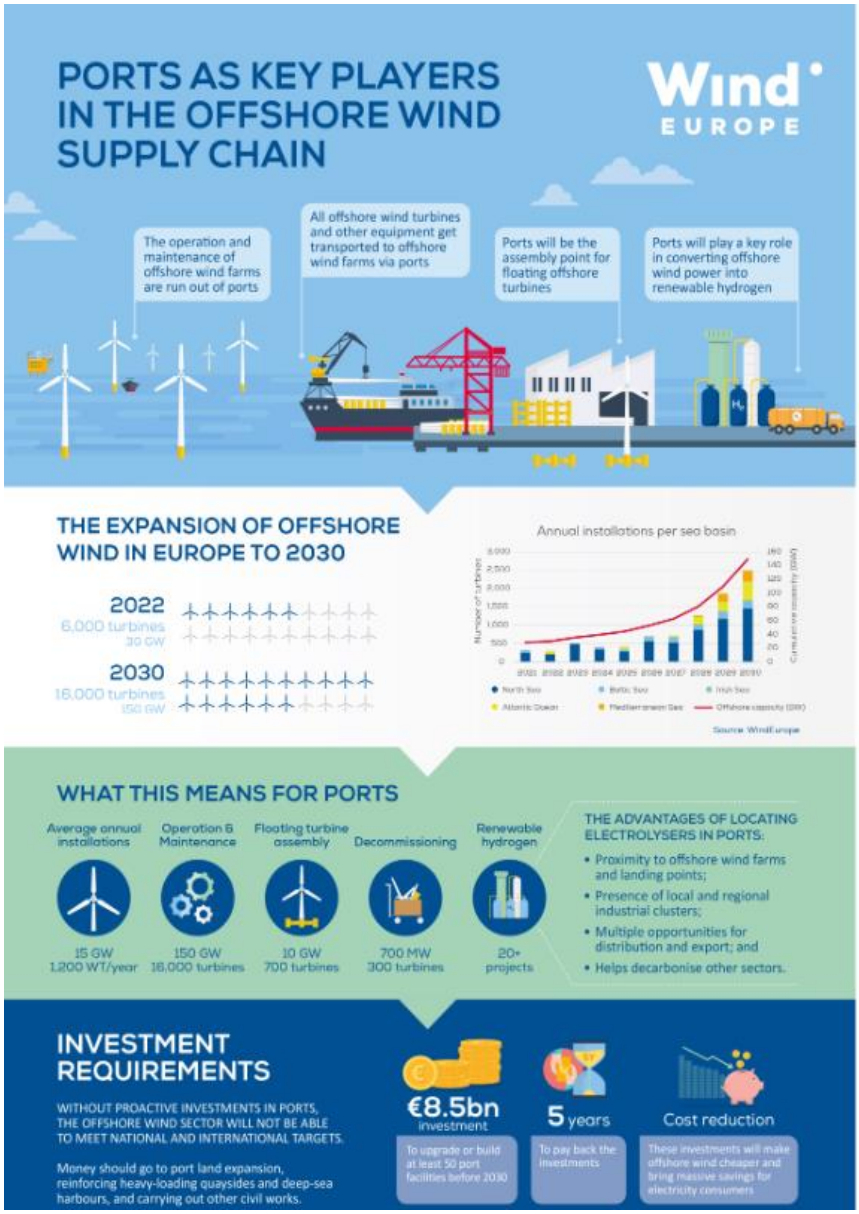
It is worth just looking further at FLOW ports at a macro level and an NREL[7] document defines the port requirement for FLOW when it says there are three primary types of sites that will be relevant for floating offshore wind energy activities:

- **Manufacturing/Fabrication (MF)** Site. This port site is located on a navigable waterway that receives raw materials via road, rail, or waterborne transport, creates larger components in the offshore wind supply chain, and loads these components onto vessels to transport them to a staging and integration site. This site typically includes factory and/or warehouse buildings and space for storage of completed components. Major offshore wind components (such as blades, nacelles, towers, and floating platforms) are so large that they need to be fabricated at port sites because they cannot be transported overland.
- **Staging and Integration (S&I)** Site. This site receives, stages, and stores offshore wind components and is where the floating wind turbine system is assembled for towing to the offshore wind area. In addition to turbine integration activities, this site is likely to perform major maintenance on a fully assembled turbine system that cannot otherwise be performed in the offshore wind area, such as replacement of a nacelle or blade. S&I sites could eventually be used for decommissioning of floating wind projects.
- **Operation and Maintenance (O&M)** Site. This site provides a base of wind plant operations with warehouses/offices, spare part storage, and a marine facility to support vessel provisioning and refuelling/charging for vessels during the construction and operational period of the offshore wind plant.

[7] https://www.nrel.gov/docs/fy23osti/86864.pdf

An O&M port is actually required for fixed-bottom offshore sites as well and it could in theory service both types of these sites from the one location.

Wind Energy Ireland (WEI) in 2022 did an extensive National Port Study [133] and there was an earlier report done in 2018 by the Irish Marine Development office – A Review of Irish Ports Offshore Renewable Energy Services [9], the latter was used as the basis for the National Ports Policy consultation [2]



[155]

END OF LIFE PLANNING

Provision for end-of life needs to be part of considerations as it will start coming into play in 2040's. The request is that is acknowledged in the policy statement and that provisions are made for space at ports, a review of what the best strategy will be to be done in time, and provision for ongoing headcount to be allowed for this activity.

Though addressed somewhat on the webinar number 2 by BVG (Leo Bartels), and with planning running out to 2060 in some of the slides, it is believed that by 2040's this matter will become a factor. End-of-life planning for offshore wind installations will be a reality for the infrastructure, ports and supply line. It would be hoped that this sector will contribute to the economy for a significant period of time.

Catapult outline the various scenarios that could be considered and possibly this out of scope, but it worth noting in the Future Framework document as a key step. The scenarios looked at were as follows:

• Full removal • Partial removal • Full repowering • Partial repowering, and • Life extension [8]

They talk about an end of life of 25 years, but other reference talk about blades having a life of 20 years, for example.

The purpose here is not delve any further into this at the point but this needs to be factored into all planning scenarios. Which of these scenarios might relevant is not for comment here, but some scenario will apply. In the harsh conditions of the Atlantic a stated life for a turbine at 25 years may be a challenge.

[8] https://ore.catapult.org.uk/wp-content/uploads/2021/04/End-of-Life-decision-planning-in-offshore-wind_FINAL_AS-1.pdf

Mature Technology approach – Plan Lead

Consideration to be given to a plan-led, iterative approach to step changes in the turbine MW range. A maturity step would be based on a MW rating, with a proven installation track record, and the attaining of agreed reliability, before the use of the unit is allowed in the Irish ORE rollout. The purpose of this is to give assurance to the supply line chain for a period of time, and volume to the manufacturers to allow for certainty on investment into manufacturing capabilities.

In creating this Future Framework document there is an opportunity to look back at the **Plan-Led** approach and apply it to technology in these early days of the FLOW in particular. The draft document does use the terminology of plan-led and mature technology. The industry cannot chase the race on the size of the next turbine and assume bigger is better. In an industry which has been experience financial challenges within the manufacturing sector, in particular with turbines, a line of certainty will assist in the ability to work suppliers on capacity and the ability of the manufacturers to develop manufacturing around a knowledge base of what is going to used, within a time period. This stepped time period is one within which a turbine is considered, through performance and reliability metrics, to have reached a level of maturity.

A 2023 article 'Scale Up Smarter, Not Harder – Why Offshore Wind Ambitions Can Be Met More Efficiently if Turbine Growth Is Paused'. It says that the offshore industry has reached a level of maturity through early governmental support that allows the sector to be competitive against conventional power plants. This causes a race for bigger turbines so developers, understandably, can be more competitive in tenders. ''However, this has spurred a development race among turbine OEMs that has proven to be highly unsustainable for the entire supply chain and infrastructure.'' [156] The article opines that ''it is imperative that attention is shifted from cost to the value, speed, security, and resilience of the supply chain.'' Having a plan-led step change approach, over time, will increase the certainty and contribute to a successful project rollout.

The technology life cycle is a model that describes the different stages that a technology goes through from its initial development to its eventual decline. This model can help businesses, and in this case the Irish Government, and innovators understand the stages of technology development, anticipate future trends, and make strategic decisions about investment and development. [157] This can be defined in 4 stages–

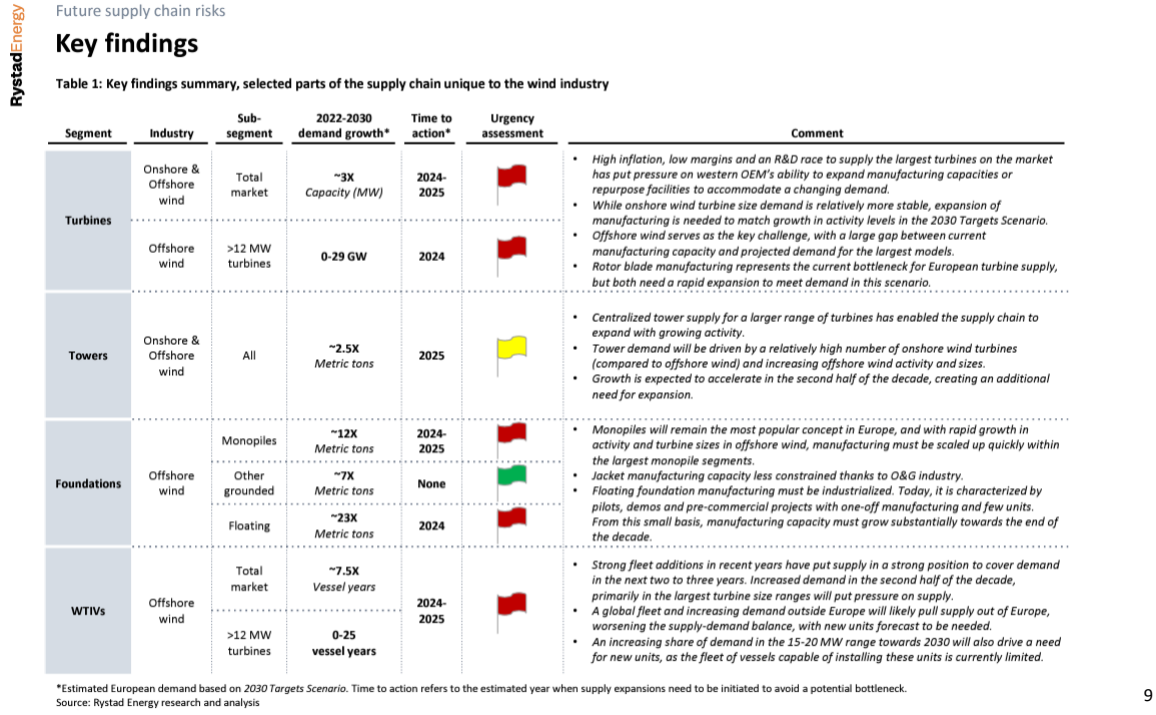
a. Innovation stage – initial development and introduction – untried
b. Growth Stage – The technology is now refined, and new competitors enter the market – it becomes the new norm. Competition will be centred here, and products will develop and be able to show real performance metrics in the environments that in Ireland case, can equate to the environment in the Atlantic for example.
c. Maturity Stage - At this stage, the technology becomes more standardized and widely adopted, and growth begins to slow down. The market becomes more saturated, and competition becomes more intense. Companies focus on reducing costs and increasing efficiency, rather than investing in new innovations.
d. Decline Stage - this when the newer technologies start overlapping as they will have completed stages and are now hitting the maturity stage, so time to move up a level.

There are many models with three, four and five stages and the one chosen is just an example. Another model talks about the stages in Innovation, Syndication, Diffusion and Substitution, but the diffusion and maturity stage equate to one another. [158] This article gives an excellent example

where the decision was made by a developer to stay at a lower MW turbine as the ability to supply offshore foundations would have been slowed with the bigger turbine and when netted out the developer would have supplied a higher MW from the offshore field in the same timeframe with the smaller turbine. Bigger is not always better!

Logic says that the goals of the FLOW project will be achieved faster and more efficiently if the unstainable turbine race is not slowed down and the market can look at a mature supply line, in which suppliers can have some certainty, load the manufacturing process for a planned period of time, and deliver a mature and reliable product.

A 2023 report from Wind Europe and Rystad Energy notes under turbines in its key findings that 'Offshore wind serves as the key challenge, with a large gap between current manufacturing capacity and projected demand for the largest models.' See the graphic below.



RystadEnergy

Future supply chain risks

Key findings

Table 1: Key findings summary, selected parts of the supply chain unique to the wind industry

Segment	Industry	Sub-segment	2022-2030 demand growth*	Time to action*	Urgency assessment	Comment
Turbines	Onshore & Offshore wind	Total market	~3X *Capacity (MW)*	2024-2025		• *High inflation, low margins and an R&D race to supply the largest turbines on the market has put pressure on western OEM's ability to expand manufacturing capacities or repurpose facilities to accommodate a changing demand.* • *While onshore wind turbine size demand is relatively more stable, expansion of manufacturing is needed to match growth in activity levels in the 2030 Targets Scenario.* • *Offshore wind serves as the key challenge, with a large gap between current manufacturing capacity and projected demand for the largest models.* • *Rotor blade manufacturing represents the current bottleneck for European turbine supply, but both need a rapid expansion to meet demand in this scenario.*
	Offshore wind	>12 MW turbines	0-29 GW	2024		
Towers	Onshore & Offshore wind	All	~2.5X *Metric tons*	2025		• *Centralized tower supply for a larger range of turbines has enabled the supply chain to expand with growing activity.* • *Tower demand will be driven by a relatively high number of onshore wind turbines (compared to offshore wind) and increasing offshore wind activity and sizes.* • *Growth is expected to accelerate in the second half of the decade, creating an additional need for expansion.*
Foundations	Offshore wind	Monopiles	~12X *Metric tons*	2024-2025		• *Monopiles will remain the most popular concept in Europe, and with rapid growth in activity and turbine sizes in offshore wind, manufacturing must be scaled up quickly within the largest monopile segments.* • *Jacket manufacturing capacity less constrained thanks to O&G industry.* • *Floating foundation manufacturing must be industrialized. Today, it is characterized by pilots, demos and pre-commercial projects with one-off manufacturing and few units. From this small basis, manufacturing capacity must grow substantially towards the end of the decade.*
		Other grounded	~7X *Metric tons*	None		
		Floating	~23X *Metric tons*	2024		
WTIVs	Offshore wind	Total market	~7.5X *Vessel years*	2024-2025		• *Strong fleet additions in recent years have put supply in a strong position to cover demand in the next two to three years. Increased demand in the second half of the decade, primarily in the largest turbine size ranges will put pressure on supply.* • *A global fleet and increasing demand outside Europe will likely pull supply out of Europe, worsening the supply-demand balance, with new units forecast to be needed.* • *An increasing share of demand in the 15-20 MW range towards 2030 will also drive a need for new units, as the fleet of vessels capable of installing these units is currently limited.*
		>12 MW turbines	0-25 vessel years			

*Estimated European demand based on *2030 Targets Scenario*. Time to action refers to the estimated year when supply expansions need to be initiated to avoid a potential bottleneck.
Source: Rystad Energy research and analysis

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A 2023 report from DNV – Offshore Wind 2023 – New Ambitions, New Challenges, says the following 'With the new targets of several European countries (but also global ambitions of many regions) the demand for offshore wind related developments and the demand for equipment increased. Larger markets with increased and accelerated targets obviously require the supply chain to grow at the same rate to capture the market and to allow a healthy supply demand mechanism. However, the turbine supply for many years has been working on a much lower level and –as said above- a very volatile project driven level, which now requires a fast ramp up.

Specifically, the turbine supply chain has suffered under the cost reduction ambition in the past. The combination of a cost reduction target and the related demand for new larger technology (turbine capacity and size) led to very limited or to no scale effects on certain product lines.' [159]

In a recent strategy document from Vestas, one the leading suppliers of wind turbines, it says that the ''speed of introduction of bigger wind turbines to the market will slow'. It suggests that offshore requires a vision of 2-3 years beyond given the current lead times. Their strategy seems to be tending

[9] https://www.review-energy.com/fileuploads/user/FINAL%20Rystad%20Energy%20-%20Wind%20Supply%20Chain%20Report-WEB.%5B1%5D.pdf

towards meeting a customer requirement to turbines that are workable in today's environment, rather than banking on future technology developments. [160] This strategy would seem to align itself very much with what is been said here in this submission.

> There is a lot of considered opinions that we must focus on deploying the proven or mature technology we have already and enabling the development of a sustainable and scalable supply chain and on expanding the infrastructure to execute and operate our projects. 'The ongoing race to develop larger turbines poses a significant threat to supply chain investments, as manufacturers cannot be certain that their multi-million-euro capacity investments will remain future-proof and may be depreciated too quickly. This dynamic may result in investment decisions being delayed or not taken at all throughout the supply chain.' [156]
>
> Nielsen at Vestas recently emphasised the need for responsible development. "The only way that can actually attend to the market demand is to slow down the growth of turbines," he said, adding: "This industry needs to mature, and everyone has to make money in the supply chain to make it last." [161]
>
> Currently a 10 or 11MW turbine (depending on the supplier) is perceived to be relatively mature, but the expectation for Ireland would be that a 15MW turbine will be in that stage before floating commences its rollout and from a plan-led perspective a plan around that size turbine should be developed. Dogger Bank in the UK, one of the biggest offshore sites, using fixed bottom turbines, is using the GE Haliade-X 13MW turbine, while it also announced a 14 MW turbine in that range. [162] Vestas V236 is a 15 MW just having developed, while Siemens Gamesa SG 14-236 DD is also in that range at 15 MW.
>
> In China there are bigger turbines out there in various stages of development and trials. Goldwinds GWH252 is rated at 16MW and the Mingyang MySE is also 16MW but have unveiled an 18 MW unit. GE have also said they are working on a 17MW and 18 MW unit. There are others on the way. But there would be concerns of the logistics surrounding the installation of turbines with a such a long supply line, distance wise, and the ongoing maintenance and support aspects on.
>
> But again, we should not follow the chase for bigger machines until maturity to proven. Capacity needs to be built and stability offers that opportunity. 'Industry observers say it could be difficult to reach that level of investment if goal posts keep moving. Others are concerned about the reliability of rapidly evolving turbines, as they are still untested in the real world.' [163]
>
> In summary, there are two inputs that should be considered -
>
> a) Continued the Plan-Led approach to technology and set a parameter around the size of the turbine to be used based on maturity of technology, ensuring that the rollout has a higher reliability threshold and better chances of success. Work with the industry to develop that step criteria to move up in size. This window to be two to three years potentially.
> b) Ports should be future proofed as part of their development plans and prepare for the bigger 17 to 20MW units in their design, though they will initially contend with say a 15MW turbine. This is the approach taken in RenewableUK document previously referenced, and is a sensible approach. [125]

Appendices:

APPENDIX 1 KEY DOCUMENTS FOR REFERENCE

Earth Summit Rio De Janeiro 1992	https://www.un.org/en/conferences/environment/rio1992
COP 1 – Kyoto 1995 UN Framework Convention on Climate Change (UNFCC)	https://unfccc.int/kyoto_protocol
COP 21 Paris Agreement 2015	https://unfccc.int/process-and-meetings/the-paris-agreement
COP 26 Glasgow Climate Pact 2021	https://webarchive.nationalarchives.gov.uk/ukgwa/20230311050138/https://ukcop26.org/the-conference/cop26-outcomes/
COP 28 Dubai	https://unfccc.int/news/cop28-agreement-signals-beginning-of-the-end-of-the-fossil-fuel-era

Figure 21 Global Agreements

European Green Deal 2019	https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en
Renewable Energy Directive, Directive (EU) 2018/2001, (RED II)	https://eur-lex.europa.eu/eli/dir/2018/2001/oj
Renewable Energy Directive: Fit for 55 package - 2023 - RED III	https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal/fit-55-delivering-proposals_en
RePowerEU	https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131
Nature Restoration Law 2022/0195 (COD)	https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law_en
Birds Directive (Directive 79/409/EEC)/Amended in 2009 (Directive 2009/147/EC)	https://environment.ec.europa.eu/topics/nature-and-biodiversity/birds-directive_en
Common Fisheries Policy (CFP)	https://oceans-and-fisheries.ec.europa.eu/policy/common-fisheries-policy-cfp_en
Water Framework Directive (2000/60/EC)	https://environment.ec.europa.eu/topics/water/water-framework-directive_en
Environmental Impact Assessment Directive 2014/52/EU	https://environment.ec.europa.eu/law-and-governance/environmental-assessments/environmental-impact-assessment_en
Maritime Spatial Planning EU Directive 2014/89/EU	https://www.eea.europa.eu/policy-documents/directive-2014-89-eu-maritime
Marine Strategy Framework Directive (MSFD) 2008/56/EC	https://www.eea.europa.eu/policy-documents/2008-56-ec
EU Offshore Renewable Energy Strategy 2020	https://energy.ec.europa.eu/topics/renewable-energy/offshore-renewable-energy_en
EU Strategy to Harness the potential of offshore renewable energy for a climate neutral future	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A741%3AFIN
EU Strategy on Offshore Renewable Energy (COM (2020) 741)	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2020%3A741%3AFIN

Figure 22 EU Policy and Directives

Government Policies	
National Ports Policy 2013	https://assets.gov.ie/11557/277d22d364fe4c13be390493282c0557.PDF
White Paper: Irelands Transition to a low Carbon Economy Future 2015-2030	https://www.gov.ie/en/publication/774e2-national-development-plan-2021-2030/
Climate Action Plan 2019	https://www.gov.ie/en/publication/ccb2e0-the-climate-action-plan-2019/
National Energy and Climate Plan 2019	https://energy.ec.europa.eu/system/files/2020-08/ie_final_necp_main_en_0.pdf
Marine Planning Policy Statement Nov 2019	https://www.gov.ie/en/publication/3e262-marine-planning-policy-statement/
Programme for Government 'Our Shared Future' 2020	https://merrionstreet.ie/en/about/programme-for-government/programme_for_government_our_shared_future.html
Policy Statement on the facilitation of Offshore Renewable Energy by Commercial Ports in Ireland 2021	https://assets.gov.ie/211860/1484054d-eab2-4b33-b4c0-8d1619656940.pdf
Policy Statement on the Framework for Irelands Offshore Electricity Transmission System 2021	https://www.gov.ie/en/publication/5ec24-policy-statement-on-the-framework-for-irelands-offshore-electricity-transmission-system/
Offshore Renewable Electricity Support Scheme (ORESS)	https://www.gov.ie/en/publication/5099a-offshore-renewable-electricity-support-scheme-oress/
ORESS 2 Offshore Renewable Electricity Support Scheme Phase 2 – Consultation Document	https://www.gov.ie/en/consultation/0f38c-consultation-on-oress-auction-design/
Climate Action Plan 2023	https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/
Climate Action Plan 2024	https://www.gov.ie/en/publication/79659-climate-action-plan-2024/
White Paper on Enterprise 2022-2030, issued in 2022	https://enterprise.gov.ie/en/publications/white-paper-on-enterprise-2022-2030.html
Accelerating Ireland Offshore Energy Programme – Policy Statement on the Framework for Phase 2 Offshore Wind 2023	https://www.gov.ie/en/publication/f3bb6-policy-statement-on-the-framework-for-phase-two-offshore-wind/
OSPAR 2008 – 3 Guidance on Environmental consideration for offshore wind farm development	https://www.ospar.org/work-areas/eiha/offshore-renewables
Review of National Ports Policy 2013	https://assets.gov.ie/274074/fba467e2-4371-46bf-982a-88b581a8772d.pdf
Consultation on the offshore renewable energy (ORE) Future Framework Policy Statement January 2024	https://www.gov.ie/en/consultation/747c7-consultation-on-the-offshore-renewable-energy-ore-future-framework-policy-statement/
Future Framework for Offshore Renewable Energy – Policy Statement 2024	https://www.gov.ie/en/publication/0566b-future-framework-for-offshore-renewable-energy/

Figure 23 Summary of Irish Government Policies

Government Legislation	
Harbours Act 2015	https://www.irishstatutebook.ie/eli/2015/act/61/enacted/en/html
Planning and Development (Amendment) Act 2018	https://www.irishstatutebook.ie/eli/2018/act/16/enacted/en/html
Climate Action and Low Carbon Development (Amendment) 2021	https://www.gov.ie/en/publication/984d2-climate-action-and-low-carbon-development-amendment-bill-2020/#:~:text=Climate%20Action%20and%20Low%20Carbon%20Development%20(Amendment)%20Bill%202021,-From%20Department%20of&text=The%20Climate%20Action%20and%20Low,by%20no%20later%20than%202050.
Maritime Area Planning Act 2021	https://www.irishstatutebook.ie/eli/2021/act/50/enacted/en/html
Maritime Jurisdiction Act 2021	https://www.irishstatutebook.ie/eli/2021/act/28/enacted/en/html
Planning and Development, Maritime and Valuation (Amendment) Act 2022	https://www.irishstatutebook.ie/eli/2022/act/29/enacted/en/html
Planning and Development Regulations 2001	https://www.irishstatutebook.ie/eli/2001/si/600/made/en/print
Planning and Development Regulations 2003	https://www.irishstatutebook.ie/eli/2003/si/90/made/en/print
Marine Planning and Development Bill 2019 (not enacted)	https://assets.gov.ie/118458/a49cd595-d789-4e5b-9f23-156876cb5538.pdf
Planning and Development Act 2000 revised 24th July 2023	https://revisedacts.lawreform.ie/eli/2000/act/30/revised/en/html
Foreshore Act 1933 Revised Updated to 17 July 2023	https://revisedacts.lawreform.ie/eli/1933/act/12/revised/en/html#:~:text=REVISED-,Updated%20to%2017%20July%202023,TO%20FORESHORE%20AND%20THE%20SEASHORE.
Planning and Development Bill 2023	https://www.gov.ie/en/press-release/833dd-planning-and-development-bill-2023-is-published/
Marine Protected Areas Bill 2023 -draft	https://www.gov.ie/en/publication/e00ec-marine-protected-areas/

Figure 24 Summary of Irish Government Legislation

Government Strategies	
Offshore Renewable Energy Development Plan 2014 (OREDP I)	https://assets.gov.ie/27215/2bc3cb73b6474beebbe810e88f49d1d4.pdf
National Development Plan 2018-2027	https://climate-laws.org/document/national-development-plan-2018-2027_abaa
National Development Plan 2021-2030	https://www.gov.ie/en/publication/774e2-national-development-plan-2021-2030/
National Marine Planning Framework	https://www.gov.ie/en/publication/60e57-national-marine-planning-framework/
Project 2040 - National Planning Framework, Feb 2018	https://www.npf.ie/project-ireland-2040-national-planning-framework
The Marine Strategy Framework Directive (MSFD) 2021	https://www.gov.ie/en/publication/f8aa5-the-marine-strategy-framework-directive-msfd/
Natura Impact Statement (NIS), 2022	https://assets.gov.ie/230385/674dc7c1-c7ba-47e6-a33e-636c121a44fa.pdf
Strategic Environmental Assessment (SEA), March 2022	https://www.gov.ie/en/publication/7e1aa-strategic-environmental-assessment-guidelines-for-regional-assemblies-and-planning-authorities/
Appropriate Assessment	https://www.npws.ie/protected-sites/guidance-appropriate-assessment-planning-authorities
Offshore Renewable Energy Development Plan II (Draft 2023)	https://www.gov.ie/en/publication/71e36-offshore-renewable-energy-development-plan-ii-oredp-ii/
Public Consultation on development of a National Industrial Strategy for Offshore Wind 2023	https://www.gov.ie/en/consultation/9b303-public-consultation-on-the-development-of-a-national-industrial-strategy-for-offshore-wind/
National Hydrogen Strategy	https://www.seai.ie/technologies/ocean-energy//ocean-policy-and-funding/offshore-renewable-energy/Technology-Roadmap
Building our Potential – Ireland's Offshore Wind Skills and Talent Needs January 2024	https://www.skillnetireland.ie/insights/building-our-potential-irelands-offshore-wind-skills-and-talent-needs
Powering Prosperity – Ireland's Offshore Wind Industrial Strategy	https://enterprise.gov.ie/en/publications/publication-files/powering-prosperity.pdf
Draft First Revision to the National Planning Framework July 2024	https://www.npf.ie/consultation-on-the-first-revision-to-the-national-planning-framework/draft-revised-national-planning-framework/
Offshore Renewable Energy Technology Roadmap	https://www.seai.ie/technologies/ocean-energy//ocean-policy-and-funding/offshore-renewable-energy/Technology-Roadmap

Figure 25 Summary of Irish Government Strategies

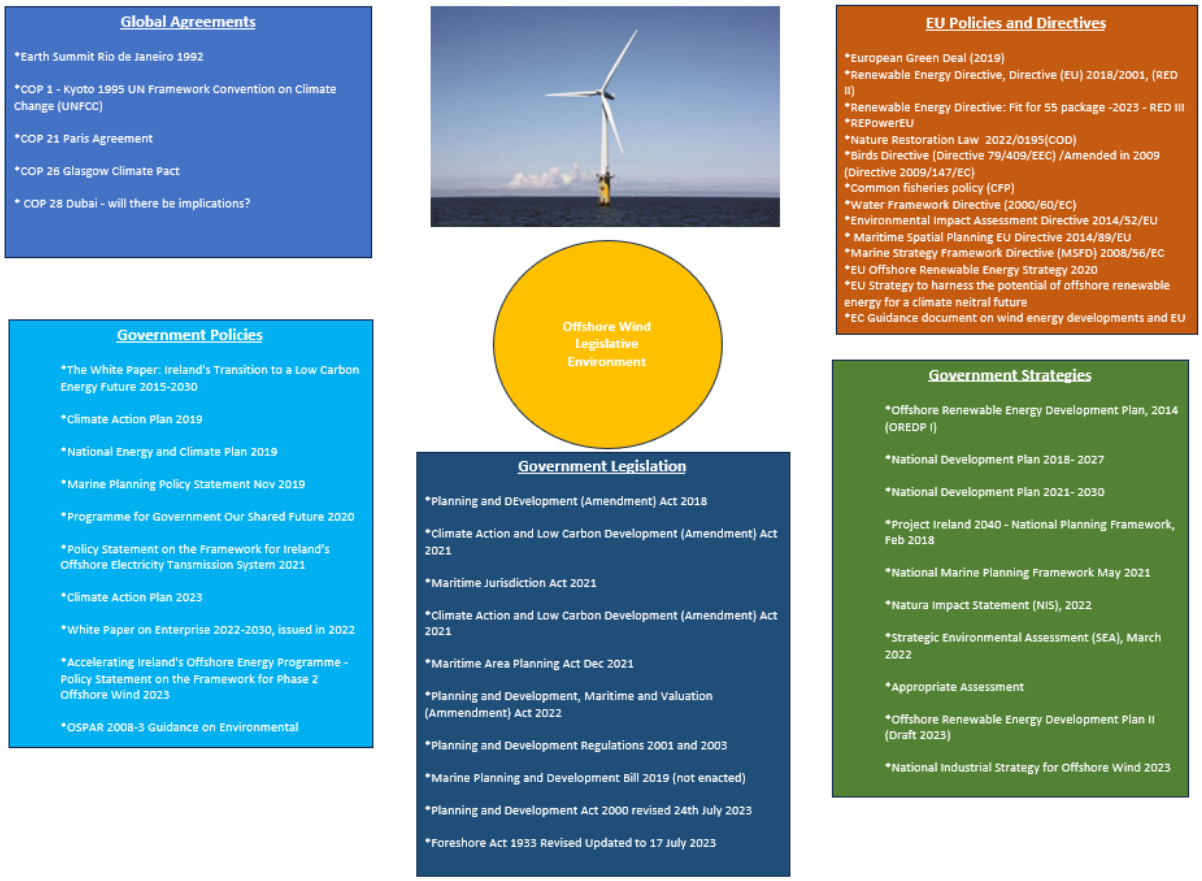

Figure 26 Offshore Legislative Environment

North Seas Energy Cooperation

NSEC tender planning – November 2023

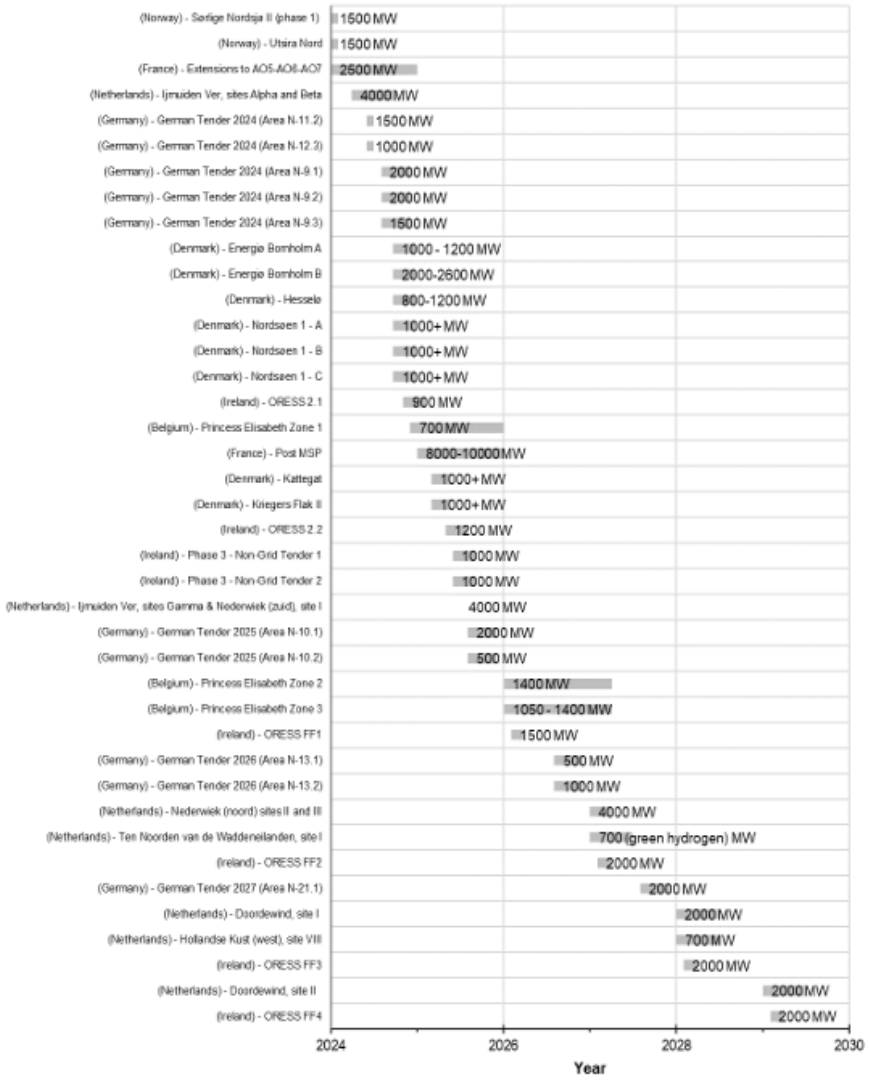

Figure 27 NSEC Indicative Tendering Phase [131]

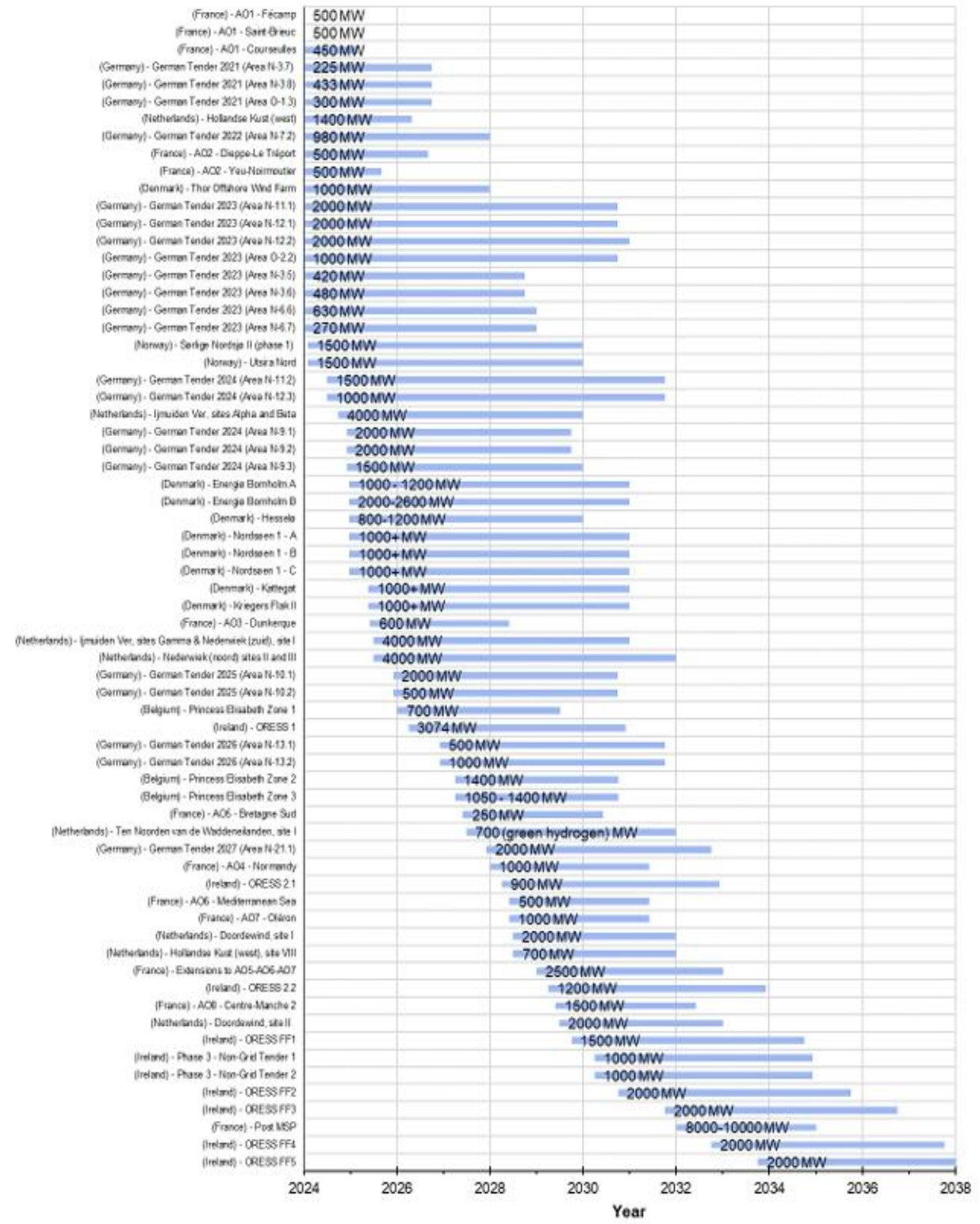

Figure 28 NSEC Indicative Construction Phase [131]

ARTICLE 1 OVERCOMING THE CHALLENGE IN DELIVERING OFFSHORE WIND DEVELOPMENT FOR IRELAND

Bill Duggan & James G Carton

There is concern that Ireland's ability to deliver our renewable energy targets will be seriously affected by a shortfall in its ports ability to facilitate its offshore rollout.

Today offshore wind provides 3% of Europe's electricity consumption, aiming to be over 20% by 2040. Ireland is falling behind in these efforts with offshore wind providing less than 0.004% of the country's electricity consumption; with ambition for offshore wind to provide almost 100% of our electricity by 2040. That is the challenge that Ireland has signed up to and is determined to deliver on, based on government statements, policies, and strategies.

This delivery of offshore renewable energy is a key requirement and necessity in order to meet Ireland's decarbonisation commitments as well as our energy security demands. It also presents an opportunity for Irish society, providing positive benefits for the foreseeable future with thousands of jobs anticipated.

A review of offshore delivery and progress to date for Ireland indicates that many positive steps have been taken by government to clear the obstacles to a smooth implementation of offshore wind:

- The government's decision to go plan led over developer led for offshore renewable energy development.
- The packaging of legislation to dedicate resources and assign timelines to the planning process, as well as establishing a dedicated court for the judicial review process for renewable energy.
- The setting of the Offshore Wind Delivery Taskforce (OWDT) as the kernel to the government approach, spanning all relevant departments enabling effective communication and decision making.
- Ireland joining the North Sea Energy Cooperation (NSEC) in 2022 to help accelerate the urgency of Ireland delivering on its offshore wind commitments.
- Ireland's commitment to marine biodiversity, environment conservation and restoration being central to Ireland delivering on our offshore wind commitments with public support.

However, a few monumental challenges have been identified; the main one being ports.

The government plan has decided that fixed bottom offshore wind is being rolled out first, mainly along the east and south coast. Everyone agrees ports are necessary to build infrastructure at sea. However, knowing how ports operate matters; any offshore wind installation season is less than 6 months (during a calm summer), the closer the port to the site the better (being ideally within 100 nautical miles) because specialised ships are required for these offshore installations and these ships are not cheap or common. Sailing long distances, between ports or from other countries to the installation site, is an expensive and poor use of resources, that will escalate the implementation costs and ultimately increase the cost of energy to the customer. Finally, any port can only support on average 50 installations a season, factors such as access channels width and depth, quay capabilities around draft and load bearing, laydown area and space in general must be considered (the length of a single blade is up to 120m, weighing 50tonnes each and nacelles weigh from 500tonnes each, upwards). This infers at least 2 ports are needed to deliver Irelands 2030 targets (assuming we start building in 2

years). On top of this offshore floating infrastructure requirements are different and these may need an additional 2 dedicated ports, incorporating manufacturing and installation capabilities, by the early 2030's.

Currently, there is no port in the Republic of Ireland capable of deploying any offshore wind farms.

However, is there a port potential capabilities on the east coast?

- Belfast is the only port on the island that can support fixed bottom installations at this time, but it is not 'ours' and is also heavily linked to UK and NI project rollouts. Outside of the potential of Belfast which may not be available, the answer is no.
- Rosslare Europort is actively progressing its plans to develop its capabilities with construction scheduled for 2025/26, with project completion anticipated in 2027, this will help, but where else?
- Dublin port, because of its space constraints is not being considered as a potential site.
- The potential for Bremore Port project, from the Drogheda Port Company, brings a lot to the table with a purpose-built facility with all the capabilities, specification and area required for fixed bottom for the east towards 2030 and floating on the east and south in the future.
- Foynes and Galway on the west and the Cork on the south have been discussed as potential locations and deserve consideration. Foynes for future floating infrastructure while Cork as a second fixed bottom for the east and south coast, with options to move to floating in the future.
- The last resort option is to use other UK or EU ports (if available to us), but EU ports are ramping up to meet their own national targets.

Ireland cannot depend on other countries to provide a solution to our own port shortfall. Port space is a pan Europe issue and Ireland needs its own solutions. Solving the port conundrum should be a national priority as exporting these projects to other jurisdictions will not contribute to Irelands economy and jobs and most of all our energy security.

While the port requirements are acknowledged as being required and has a dedicated workstream within the Offshore Wind Delivery Taskforce, the level of activity and the ability of these ports in Ireland to commit the financial resources to develop what is required is open to question.

The current port model is one of publicly controlled port authorities with high levels of private-sector involvement in the provision of infrastructure and services. The Ports Policy (2013, and currently under review) states that that 'the ports sector should receive no further exchequer funding for infrastructure development'.

Ports are key facilitators as delivery and installation hubs, manufacturing, and construction centres, as well delivering the operations and maintenance functions (O&M). In many European locations, ports are often green energy hubs accommodating offshore wind cable landing, energy storage, green hydrogen production, etc.

In order to deliver any of these facilities Ireland need to invest substantially in infrastructure and expand the space requirement for offshore wind projects, but the existing model of Irish ports, and their inability to draw on state funds, as detailed in Ireland's Port Policy, ensures that a financial case for investment from its own resources is practically unattainable.

The Department of Transport has established a project team in 2023 to accelerate port-developer engagement to support commercial financing and EU funding to deliver port infrastructure to facilitate

offshore wind. However, with a plan-led approach, state investment in designated ports infrastructure is something that needs to be seriously considered for projects in Ireland to be successful. It is noted that if Ireland wants to do most of the main offshore wind activities in its own ports, a total investment of €2-3 billion would be required.

There are only 4 to 5 ports capable of delivering the offshore rollout for Ireland and if we are to deliver on national commitments and reap the security and economic benefits through employment and added value work done at ports in our country, actions are required today:

- The timeline of completion of the revised National Ports Policy in Ireland by Q2 2025 needs to be brought forward, as the issuing of the new Ports Policy is a matter of urgency.
- The future of offshore wind is certain, but finance or funding certainty needs to be secured.
- Expanding the Governments Plan Led approach; focusing on 'fixed bottom offshore wind', it would be essential that a plan is developed to ensure that the ports of Rosslare, Cork, and potentially Bremore are developed and delivered.
- Expanding the Governments Plan Led approach; focusing on 'floating offshore wind', it would be essential that a plan is developed to ensure that the ports of Shannon Foynes, Cork, and potentially Bremore are developed and delivered.

Solutions are not easy but what is certain is that without ports in Ireland, to facilitate the ability to rollout, the offshore renewable energy projects will not happen smoothly. Ireland must deliver on its commitments and maximise the return to its people for many years to come.

May 27th
https://www.irishexaminer.com/news/arid-41403770.html

ARTICLE 2 FLOATING WIND ENERGY FIXED ON SOUTH AND EAST IRELAND

James G Carton and Bill Duggan

Not all countries will have suitable infrastructure for offshore wind and 23% of countries are landlocked. However, Ireland sits on the biggest natural offshore wind resource in Europe with some 640GWs of untapped energy potential. Our requirements are far outweighed by our potential with the ability to underwrite the economy and energy security for many decades to come.

Ireland's offshore wind resource potential can be categorised into two distinct categories, fixed bottom, and floating installations. Though both use the same turbine technology and will extend out of water by over 280m, they are distinctly different in use, in port and installation requirements. Fixed bottom is a 'shallow' water solution, up to 60 meters while floating is for deeper waters. The proportion of energy by 2050 for Ireland is estimated to be dominated by wind; 11.5GW onshore and about 10GW fixed offshore wind and at least 30GW of floating offshore wind. For a country that traditionally spoke about a lack of natural resources, Ireland sits on vast offshore wind energy potential. But there is a BUT!

Ireland's current strategy is to focus on rolling out fixed bottom installations initially, on the east and south coast, with floating installations to follow off the west coast of Ireland from 2030 onwards. But the question to ask is, is that the right strategy? Is there an alternative approach and what are the implications?

Floating offshore wind is an emerging technology, while fixed offshore wind is a more mature technology. Floating technology is not new and has been used in the offshore oil and gas industry for over a half a century, having said that the method of floating the turbine is still being developed with 40 plus designs being tested.

Globally as of early 2024, there are 208 MW of installed floating offshore wind, with 88% of the global installations being in Europe, compared to the 73GW of fixed bottom installations. The majority of floating offshore wind installations are demonstrators or pilot projects, including Kincardine and Hywind Scotland in the UK (30 MW each), WindFloat Atlantic in Portugal (25 MW) and Hywind Tampen in Norway (95 MW). All of these projects received public financial support. A total of 37 MWs of floating offshore wind was added in 2023, the biggest site Hywind Tampen is located 140 kilometres from the coast and in water depths of 260 to 300 meters provides energy to oil and gas installations in Norway.

Milestones have been reached which show that floating offshore wind is emerging from its infancy stage to becoming a solution that is more attainable with developers and governments reaffirming their commitments for providing renewable energy and also a potential source of energy for Power-to-X solutions, all part of the global energy transition.

France as an example has just completed a 25 MW floating offshore installation near Marseille, and it held the first floating offshore wind auction this year for a 250MW site in South Brittany, with two further auctions to follow in the Mediterranean sea late this year. This site will double the European capacity in floating offshore wind when completed, but more importantly indicates the near commercial viability of floating offshore wind and less reliance on public financial support.

Norway, Spain, and Portugal all plan tenders in 2024, with Italy and Greece due to follow, with floating offshore wind developments. The Portuguese site will be in the Atlantic and will be relevant to Ireland's west coast potential.

Scotland has major plans for floating offshore wind with its Offshore Win-Net-Zero roadmap speaking of 5GWs by 2030. Included in this is the Malin Sea Wind farm in the North Channel between Ireland and Scotland, which has ESB involvement. In March 2024 the UK launched a 4.5 GW Celtic Sea floating wind lease auction. The process will complete by March 2025 with three 1.5 GW plots. This development is a significant step towards establishing the UK's first commercial-scale floating wind, to be operational by the mid-2030s. Overall the UK has big ambitions with 15GWs of leases to be issued for floating offshore wind installations.

From Ireland's perspective we referred to the BUT! Ireland currently does not plan to join in with floating offshore wind development in the Atlantic until sometime in the 2030's and unfortunately possibly closer to the 2040's. Floating offshore wind in the Atlantic face's challenges and in particular in the harsh environment of the Atlantic ocean off the west coast of Ireland. Challenges such as hydrodynamic, aerodynamic, and structural interactions particularly in severe weather, all have to be catered for. Installation and maintenance are also a problem as being able to access the units to do maintenance in this environment is a challenge. But it is believed that these will be overcome in the coming years, through innovation, design, and more durable materials. Standardisation and modularisation of floating platform components and systems can facilitate their manufacturing, assembly, and installation.

BUT why wait for this? There are opportunities in the Irish and Celtic sea within our waters for floating offshore wind in a more benign sea environment, sea conditions similar to existing test sites. These opportunities can be developed ahead of the Atlantic rollout, and in turn develop our own national competency and skill set in this strategic area. The UK and Scottish authorities see the opportunity and are acting on it today! With the level of demonstrator and pilot activity already in place in Europe a floating solution for these seas can be found. In looking at the recently published south coast DMAP some of the 4 sectors designated for development have water depths which are at the edge of fixed bottom technology; so floating would be potentially the solution and could possibly be part of governments/DECC's thinking?

We have established that there is a case to be made for installing floating offshore wind in the Irish and Celtic Sea's, but the HOW is the big question as it comes back to ports. Currently there are no ports in Ireland to roll out either fixed or floating offshore wind, as discussed in a previous article.

Rosslare, Cork and Foynes were noted as the ports that need to be developed now to roll out fixed offshore wind, with Foynes the focus for floating offshore wind installation along with, possibly Cork. Working with Cork, Bantry may also have a role with its deep water attributes. Rosslare does not seem to have the depth for floating offshore wind. It then leaves the case to be considered for Bremore, which as a purpose-built port could be configured to support both fixed and floating offshore wind for the east and south coast.

Floating offshore wind turbine port requirements are not the same as fixed bottom offshore turbines. With fixed bottom offshore wind construction, the process starts with the foundations, be in monopiles or gravity base structures, these are installed ahead of the main assembly on site, at sea, and the final assembly of the turbine, tower and blades all completed at sea, operating from a specialised vessel. With floating offshore wind all the assembly is done in port onto the floating platform at quay side and towed to final destination. The process requires a manufacturing port where the platforms are made, from steel or concrete, and these are towed to the assembly port. The ports can co-exist, but outside of Foynes port, there is no space in the other ports as it stands today, and this is a huge challenge.

The question that is raised is, what is the strategy or more to the point what the government/industry plan for Irish ports is, to be able to support not only fixed based offshore wind turbines but also equally support the installation of future floating offshore wind turbines in the Irish and Celtic sea, ahead of deployment in the west Atlantic. The requirements for fixed offshore wind and floating offshore wind are different. The lead time for ports is long and the requirements are immense and so **immediate action** from the Government is needed to support Irish ports in delivering our potential vibrant renewable future. If there are no ports, there is no wind – fixed or floating!

June 25th
https://www.irishexaminer.com/opinion/commentanalysis/arid-41422483.html

ARTICLE 3 GAIN €69 BILLION OR LOSE €5 BILLION EURO - OFFSHORE WIND CAN SUPPORT SUSTAINABLE JOBS AND INCOME FOR ALL WORK DEMOGRAPHICS IN OUR ECONOMY BEYOND 2050

Bill Duggan and James G Carton

The Irish economy has developed quiet rapidly from a mainly agriculturally based economy in the 1960's, through a period of sustain growth in the manufacturing of ICT equipment, to software development, pharmaceutical industries as well as major growth in the financial and data services sector. Ireland, with its offshore wind resources has the potential to be another major step change in the economy if and only if we can harvest the energy and related economic activity, sitting in the seas and around our coasts.

Ireland has a well-founded approach to rollout offshore wind to the east, south and west with fixed bottom windfarms first in shallow waters and floating wind farms in deeper waters through auctions. And Ireland's real potential scale lies in floating wind and the ability to be able to harvest it. Offshore wind will be of the order of 4 times the magnitude of onshore wind. However, ports are a bottleneck which must be immediately actioned by government to deliver this. Ports need to be delivered not only to facilitate the rollout of the offshore windfarms but also deliver the economic boost within the island that wind development activity can bring. The alternative is continued use of insecure expensive foreign fossil fuels and missing targets, triggering a €5 Bn bill by 2030!

Wind Energy Ireland's report, 'We can build them – Supporting Irish ports to build offshore wind farms' explores the funding gap that ports will be required to solve to deliver the infrastructure and space that will be required. As stated in previous articles, the Government state departments should follow the state led development approach for the requisite port infrastructure to maximise the local content element of the work involved with the manufacturing, delivery, and installation of offshore wind. The payback in the return to the exchequer is sizeable if it is planned correctly!

However current government industrial capability strategy indicates that mainly highly skilled and professional jobs are of interest e.g. development and project management, but Ireland needs to maximise potential job and economic opportunities that capture a spectrum of jobs, from high skilled operations and maintenance roles to port marshalling and into installation. Ireland also needs to focus on manufacturing roles, e.g. concrete and steel fabrication, that can be delivered for the long-term and expand our horizons, fulfilling many of these roles and skillsets from within our economy.

It is in the manufacturing sector where serious additional opportunities can exist; not just limited to just turbine tower manufacture, floating platforms, and mooring systems, but also gravity bases and other steel structures for fixed, huge floating structures and even turbine blades; Ireland will need over 7000 blades manufactured over the next 2 decades, based on the 37GW's plan and a facility like this alone could create in excess of 750 direct jobs and 1,500 indirect jobs.

A report from the Irish governments' UK consultants (BVG) covering the regional economic impact of the offshore development and the value to be brought to the South East based on 5GWs of wind was published as part of the South Coast DMAP. Overall, ''south coast wind will deliver an estimated €4.4 billion in extra benefits to the Irish economy. It will also deliver an estimated 49,000 full-time equivalent (FTE) years of employment to the Irish economy.

Of these benefits, €2.9 billion and 32,200 FTE years is expected to be captured by the south coast region in the baseline scenario, and €3.1 billion and 34,300 FTE years in the manufacturing upside scenario. This means that the south coast region captures between 66% and 70% of the total Irish economic and employment benefits associated with the south coast DMAP. Unfortunately, within the consultants' calculations they only modelled one factory to manufacture only the towers. As we state, other/more components that can be manufactured 'locally' will come with an upside. Also note these figures relate to just 5GWs of Ireland's totalled planed 37GW of offshore wind. In one offshore wind scenario, in the Future Frameworks consultation, at least €69 billion extra is expected to the economy by mid-century. As shown, there is significant potential to deliver meaningful value to the economy through jobs and economic value add to workers pockets.

One interesting scenario from a manufacturing perspective will be the manufacturing of the floating platforms and will they be made from concrete or steel or a hybrid of both. This is in development phase within the sector but should be of interest to Ireland as we plan port development. In the government's Future Framework consultation, a steel fabricated solution was focused on and used for calculation, but the concrete solution maybe something that Ireland would be more interested in and be more suitable for Ireland. An estimate from a recent Welsh study is that the manufacture of a concrete semi-submersible substructure for a 1GW project activity would generate per annum 1,366 FTE jobs. This is mentioned here as an indicative number that has not been factored and relates to floating only, but there is potential to be explored. Ireland has more of a history in concrete than in steel fabrication of this size, and Ireland would also have much of the material required to build concrete structures within the island. An aspect that will become increasingly important is the EU carbon border mechanisms, adding costs to fossil fuel-based steel imports vs potentially green concrete from Ireland.

Ports are central to the development of offshore wind. Ireland has limited ports that can do this work. Ports play a key role for the local supply chain, manufacturing, logistics and supporting infrastructure including the storage of components. Offshore wind can support jobs and sustainable economic growth through mid-century and turn the country into a nett exporter of energy as we deliver our own goal of nett-zero by 2050. GWEC's Global Offshore Wind 2024 report confirms that 'offshore wind can serve as a catalyst for jobs by driving the expansion and modernisation of critical infrastructure'. All we need to do is start building Ports, capture offshore wind manufacturing in Ireland and reap the benefits of long-term jobs, continued economic benefit and clean low-cost energy for customers.

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ARTLICE 4 IRELAND UNLIKELY TO DELIVER 5GW'S OF OFFSHORE WIND BY 2030

Bill Duggan & James G Carton

In Irelands Climate Action Plan 2024, in setting out the targets for Irelands Offshore Wind goals, it states that ''Central to achieving these goals is the strategic increase in the share of renewable electricity to 80% by 2030. This includes ambitious targets of deploying 9 GW of onshore wind, 8 GW of solar power, and at **least 5 GW from offshore wind projects**.'' All Government plans should be marching forward to deliver this goal by 2030.

Over the last 6 months a trilogy of Government policy and strategy documents have been released that set out Irelands approach to the harvesting of offshore energy and what we as a nation are doing to reap the benefits from this untapped natural resource and delivering this 'at least' 5GW of energy. While the documents in themselves are comprehensive and detailed, they all should be based on the same set of assumptions and workings. The three documents in question include Powering Prosperity (Dept. of Enterprise, Trade and Employment), Future Framework for Offshore Renewable Energy (Dept. of Environment, Climate and Communications), Offshore Renewable Energy Technology Roadmap (SEAI). The first of these documents sets out the objectives around maximising the number of jobs that the sector can deliver and making Ireland a centre of technology excellence for the offshore industry. The Future Frameworks document in a sense follows on and looks at how we grow the industry from the early to mid-30's delivering 20GW in 2040 and 37GW by 2050. It looks at various scenarios around this.

The most recently published SEAI document on the technology roadmap is of most interest in that looks from the outset that Ireland no longer has the target of a delivery of 5GW of offshore wind by 2030, and the maximum it looks at 3.2 to 3.3GW by 2030. This relates to the ORESS 1 auction held in 2023 and seems to be assuming that the South Coast DMAP will not be delivered until after 2030. It also misses out at the addition this year of both Oriel and the Arklow Back 2 sites into the mix. Is the target of 5GW no longer policy?

The focus of our studies has been in the area of ports and the SEAI document does mention this important area. The Offshore Renewable Energy Technology Roadmap offers up Belfast as the immediate solution for the delivery of Irelands offshore windfarms, offering no short-term plan or an expression of the necessity to deliver a port infrastructure within the Republic of Ireland. It suggests that 40 turbines per annum can be done from Belfast, which, assuming 17MW turbines, is 680MW's per year. This will not deliver even 3.2GW by 2030, commencing in 2027. It goes on to say that we will continue to give business to Belfast even if the Irish ports are up and running? It is great that Belfast has capacity, but will it be available to Irelands rollout and why can we not expedite the port infrastructure in Ireland just like Rosslare? It does say that ''within the EU's general block exemption regulation, exemptions exist to facilitate state support for strategic port infrastructure investments of this kind.'' Why has this not been embedded into policy now. The revised National Port Policy is not to be released till 2025 so where is the urgency?

When it comes to floating wind installations, which the various reports put out till early 2030's there is no, again, urgency to develop the port infrastructure. Both the SEAI report and the Future Frameworks consultation process talked about using installation vessels in sheltered water to assemble floating wind turbines. This is not a solution, but a band aid, and the solution is to plan and invest in the ports. SEAI talk about 3 to 4 ports being required, and there are only 3 to 4 ports that physically can be developed to do this work. Let us select, plan, develop and implement! Surely

Ireland can have its ports in place prior to early 2030! Look across at Scotland and see what has been done.

This leads to what can be seen as a void in the documents as published. There is NO short-term plan to cover the development of key infrastructural items like ports. In the Future Framework for Offshore Renewable Energy Policy statement (2024), it says that ''critical components of Ireland's ORE system including generation, storage, **PORTS,** and grid infrastructure are informed by the National Development Plan (NDP). A quick review of the NDP does mention ports and their role in the offshore wind rollout but the NDP focuses is the connectivity aspects of ports and that it notes ports are the facilitators of ORE. It talks about helping ports access European funding streams but does mention that that ''ports do not receive Exchequer funding.'' But there is no plan to develop a port infrastructure for ORE and it seems to be up to the ports to develop the plan on an individual site basis rather than a centrally co-ordinated national plan! A recent article heading by Infrastructure Investor puts it succinctly – Ports are 'quay' for offshore wind.

The NDP companion document the National Planning Framework – part of Project Ireland 2040, currently out for consultation, continues in the same theme with connectivity to the fore when it comes to ports. Nobody is arguing that this is not important but of equal importance is a roadmap to deliver a port infrastructure to facilitate the rollout of offshore wind.

An interesting quote found in both the NDP and NFP says ''Ireland benefits from naturally occurring deep water at ports in the south and south-west, which are capable of receiving the largest ocean-going vessels and offer the potential for industrial development that depends currently, or will depend in the future, on deep water berths.'' But in reality, when it comes to offshore windfarm activity this water depth in many ports is either at the limit or too shallow for offshore wind work. The reality is that we have LIMITED port capability to be develop for marshalling and manufacturing ports, due to marine physical constraints at the ports, for offshore wind farms. There is also the challenge of space required for offshore projects and there is a lack of quay space as well. For fixed we have Rosslare, Cork and possibly Bremore and Bantry. For floating it is Shannon Foynes, possibly Cork and potentially Bantry and Killybeggs.

What we need is the plan to develop these ports as part of a national infrastructure project where the financial model is developed to support these few ports that need to be developed to deliver offshore wind. This should be a central theme of the National Development Plan and implemented through the National Planning Framework. It also should be expressed clearly in the National Ports Policy that a port is a shared resource linking connectivity and ORE in one location. The likes of Bantry (Leahill) which is a legacy site can be developed specifically for ORE, both fixed and floating, Bremore is a greenfield site, and can it be developed in time? Is the development of the derelict port of Nigg in Scotland and its transformation into a key installation port any different then what could be happening to Leahill in Bantry, as an example?

Throughout Europe there is a deficit of port capacity and should Ireland end being dependent on non-Irish ports to deliver ORE, with no pun intend, we will miss the boat and not deliver on our stated commitments to decarbonise our energy system. Ireland needs to deliver and to do so it needs a meaningful plan. 5GWs in 2030 looks to be a wish and not a plan.

ARTICLE 5 NO PLAN TO DELIVER PORT INFRASTRUCTURE

Bill Duggan & James G Carton

A major finding from the research points to Ireland not being able to deliver on our commitments to offshore wind of 5GW's by 2030 with the under development of Irish ports being a central issue. Irish ports today provide sufficient capacity to ensure Ireland maintains connectivity with, and has the capacity to support, the requirements of the national need of Ireland to trade and move freight and people, as required. The Irish Ports Capacity Study in 2023 provided a positive report on the ports ability to support these activities, but it is significant that it did not clash the activities and needs of offshore wind development and Irelands port's ability to share the port infrastructure, The report did not answer a key question – can Irish ports support the development of offshore wind farms?

In an Offshore Renewable Energy (ORE) environment, ports are central to the rollout of windfarms. Activities and services provided to ORE, range from site surveying to component manufacturing, component storage, construction, operations and maintenance (O&M) support, and finally decommissioning. In the ORE industry there are a range of port descriptors that are unique to reflect the activity which differentiates their functions from standard port use - marine survey ports, manufacturing ports, marshalling ports (staging ports), and operations maintenance ports. Specialised equipment, a dedicated laydown area, and quayside are required to lift and store big components for these large offshore wind turbines before loading them onto specialised ships. When placed in our standard ports the port needs to share quays, cranes, access channels and an ORE required 10 hectares at least of space and often more.

In the GWEC 2024 Global Offshore Wind Report 2024 they have focused on the availability of large marshalling ports to support offshore wind growth, as these facilities are emerging bottlenecks in some markets. The report says that ''Worldwide, there are more than 30 large marshalling ports, of which 16 are in the Asia Pacific region, 14 in Europe, and one in the US. These can collectively support 25 GW annual offshore wind installation capacity. Expansion plans for a total of 2.4 GW per year have been announced by some of the existing marshalling ports neighbouring the North Sea. In order to avoid supply bottlenecks significant investment will be needed in ports. Greater port capacity will be needed from 2026 in Europe. Existing port facilities are likely to be stretched beyond their capacity to meet demand unless new port capacity is built.'' None of these ports are in Ireland, and with our neighbouring UK and European ports all coping with increased demand where will capacity for Irish projects be found?

This leaves Ireland with a capacity issue which while acknowledged in policy and strategy documents there does not seem to be a plan that is being followed to address this national infrastructural deficit.

As far back as 2021 in the Governments Facilitation of Offshore Renewable Energy by Commercial Ports in Ireland report, it was stated that a minimum of two facilities will be required from 2025 onwards for deployment activity along with a number of smaller ports for the O&M activity. It stated that port location cannot be overlooked and acknowledged that the ''location of ports has operational advantages to reduce costs and delays and de-risk the construction phase of the ORE project''. It advocated this multiport solution to de-risk the project and ensure flexibility. It did not suggest which ports should be developed.

The National Ports Policy 2013 (currently being revised and due 2025) aims to allow a competitive and effective market for maritime transport services, but it effectively defines ports as private

entities and that no state funding is to be provided for the development of the current family of services. Development of additional services are to be provided from the ports own ability to raise capital and service the borrowings. That seems to be effective when it comes developing additional connectivity resources, but it does not cater for the development of the new services required by the national ORE project. It is not believed that Irish ports have the revenues and balance sheet to raise capital and deliver projects based on the scale required to cater for ORE. The level of risk associated with the project will also make private investment potential challenging. The investment needs to be made 2 to 3 years in advance of any potential return from its use and that is a big ask from a business perspective for any entity. While Connecting Europe Facility (CEF) and the European Investment Bank (EIB) have been mentioned, there is still a funding gap. This year only two Irish ports received CEF support when the successful ports were announced – Cork and Dublin – both for connectivity related projects. Dublin has no current plans to support the ORE project.

A KPMG report called, 'Ireland's Ports - unlocking offshore renewable energy', earlier this year said ''It is in the earlier stages of these projects that Government support and joined-up thinking is needed to get these projects underway. Whilst the investment required in the ports is sizeable, it is modest relative to the overall ORE and green economy investment that it will enable, and the ultimate long term economic opportunity for the State.''

There have been a number of policy and strategy documents issues over the last 6 months which sets out the direction of travel that the Government is looking at. In January 2024 a consultation was launched on the Future Framework for Offshore Renewable Energy, which resulted in the issuing by DECC of a long-term model and vision policy for ORE. It sets out a pathway to Ireland will deliver 20 GW by 2040 and at least 37GW by 2050. DETE issue its Powering Prosperity which is a strategy document to develop and maximise Irelands ability to deliver local opportunity for employment and economic benefits to through the development of the manufacturing and service sectors. In this context the Building our Potential from Skillnet and the SEAI Offshore Renewable Energy Technology Roadmap are all part of this suite of documents.

What is not in these documents is a plan for our port infrastructure! Ports loom large when you talk about the implementation of the rollout of offshore wind. Not only are they central to the development of the Irish offshore project, but they also play role for the logistics, supply chain and the supporting infrastructure that is required to enable the rollout. While we have a number of ports actively looking at this project, they can only facilitate the rollout with major investment being made to upgrade and expand the port infrastructure.

Today Irish ports have a deficit in infrastructure and while at policy and strategy level, Government has signed on to increased delivery numbers of offshore wind energy, there is little evidence that enough of the infrastructure can be delivered in the required timeframe. In the 2023 report. North Seas Offshore Wind Port Study 2030-2050, it was estimated that if Ireland wants to do all the work on our offshore windfarms in Ireland a figure of the order of €2 to €3 billion will need to be invested. If we wish to the O&M work only it will still require an investment of the order of €1 billion.

Without a port infrastructure to enable the rollout of offshore wind, the loss to the economy in potentially sites not going ahead and also through activities for installation being hosted in another country, would be an enormous loss. For a developer, after going through all the planning steps, the Financial Investment Decisions (FID) could come down to the proximity of a port to the installation area. With the cost of the shipping involved and the long distance it will have to sail, plus the uncertainty around weather openings, it may become a factor to prevent progression of a site.

In the Government's recently published Future Framework for Offshore Renewable Energy policy statement (2024) acknowledges that more than one port is required, and it is the right approach. What seems to be lacking is an actual solution and plan. It talks about 'several port facilities in Ireland are required to meet 2040 and 2050 targets based solely on initial assemble and tow out requirements not including the Belfast port, which already has capacity to service ORE projects and may contribute to Irish ORE development.' This is referring to floating wind installation but does not offer up any solution to the immediate requirement to deliver the 2030 plan with fixed bottom. The policy document also refers to the National Development Plan (NDP) 2021 and the Irish Maritime Development Office (IMDO) Irish Ports Renewable Offshore Services (IPORES) 2018 report.

The NDP does mention ports and the importance of the connectivity role that ports provide for Ireland. It refers the work on the National Ports Policy which was to commence in 2021. Currently this end its consultation phase in 2023 and is not due out till 2025. It says that it will allow 'a new Ports Policy to take account of required port infrastructure development to facilitate Ireland's future ORE sector.' It talks about the Department of Transport (DoT) and the IMDO continuing dialogue with the developers and looking into avenues in Europe of funding.

The IMDO IPORES Report is also key reference in the Future Framework document and is a comprehensive piece of work looking at providing solutions to the offshore rollout. The challenge in using the document is that it was completed in 2018 and was relevant at the time. It talked about the three ports in the Ireland plus Belfast, but it should be re-run now with modelling based on the current requirements of offshore windfarms. Technology has moved on and got bigger changing the fundamentals of the modelling. Port requirements have changed. We now also have a more defined requirements such as 5 GWs by 2030, and knowledge of the sites that been successful in the ORESS 1 process. This report also refers to the investment level required, but the recent NESC report shows that this has moved on considerable and so too is the space required due to the larger equipment now being installed.

A more recent report called the Irish Ports Capacity Study 2023 demonstrated that we are in control of our connectivity capacity and makes strong recommendations on how future development should progress, but it does not cover the competing requirements for ORE projects using the same facilities. The dynamics in this arena has also changed with the Government going with a plan led approach instead of the developer led model. Does a plan led model not put more requirements on the Government to supply the infrastructure for ports to support the ORE rollout and ensure they are in the right position and have the correct capabilities?

When these papers talk about ports it is often done in a generic manner. But there is a variety of port requirements to service the industry, as mentioned earlier, and in some categories, Ireland is well served with excellent potential. There are also differences when comes to fixed bottom and floating, so generic descriptions as disingenuous. One port does not suit all applications – typically a port set up for fixed may not be able to cater for floating.

In a plan led project or national significance, there should be a Government plan driving the development of the ports as key parts of our national infrastructure to deliver a maximum boost for the economy, enabling the state to make its commitments and deliver green energy to the country in a timely and environmentally supportive manner.

2024

Floating Wind Update

Bill Duggan, James G Carton – Revision 0

Dublin City University

9/1/2024

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It is expected by 2050 that with improvement in technology and costs decline over time, that variable renewable-energy sources will become the major player as the electricity source globally. Offshore wind fits into his grouping and floating offshore is a subset of this sector. A recent DNV report suggests that by 2050, 82% of the world's grid-connected electricity will be generated from renewable sources. Of this 69% will be from variable renewable sources. The breakdown on renewable energy is interesting. It suggests that 33% will be from wind with 11% from fixed-bottom offshore turbines with just 2% from floating offshore wind. [164] DNV 'predict that offshore wind's contribution to the wider energy mix will increase as we get closer to mid-century, reaching about 40% of total wind production with a significant scaling of global installed offshore wind capacity, from 29 GW in 2019 to 1,748 GW in 2050. Floating offshore wind is anticipated to generate 15% of all offshore wind energy by then, contributing 264 GW by 2050.' Not all countries will have suitable infrastructure for offshore wind and 23% of countries are landlocked, so onshore will always be a larger proportion of the wind energy pot.

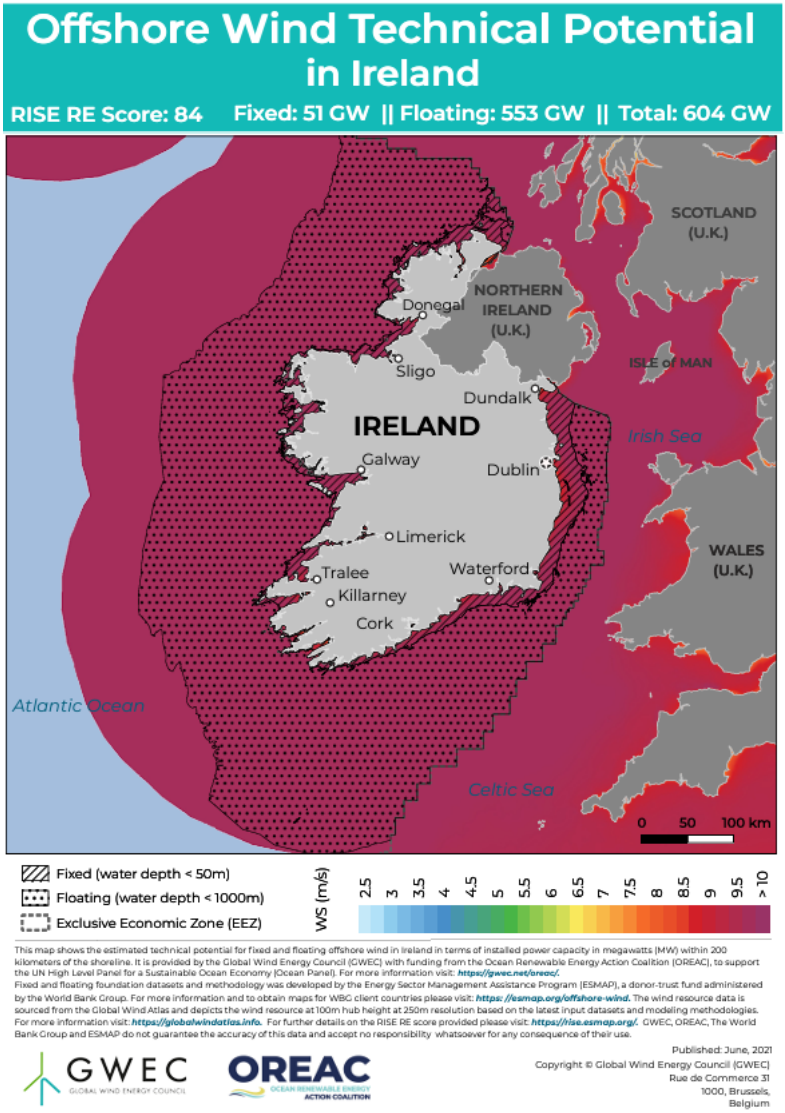


Figure 29 Potential for Wind Energy in Ireland [165]

This proportion of the mix for Ireland will be, by 2050 dominated by offshore wind. In a Wind Energy Ireland report in 2023 it looked at Ireland Offshore Wind Potential. [10] It said that Ireland's onshore capacity by 2050 was 11.5GW. But at the same time In the recent governments Future Framework for Offshore Renewable Energy talks about 20GW by 2040 and at least 37GW by 2050. They say that 76% of our wind energy will be offshore. The ratio between floating and fixed is not clear, but in order to exploit the potential that Ireland has in the Atlantic, some 553 GW according to the GWEC figure shown on the previous page, it would be expected that FLOW will be a significant part of the future strategy.

Currently based on the outturn of ORESS 1 sites as well as the potential in the recently publish DMAP SC, there is just short of 10GW of fixed bottom potential indicated. This will meet the 2030 requirement, and it can be assumed that FLOW sites will make up a significant part of the balance of 37GW planned.

FLOW will be required but it is still very much an emerging technology and there is no one-fits-all solution. There are over 40 variations of platforms being discussed, trialled, and developed, which presents a very uncertain future presently, but from an Ireland perspective we would expect some certainty by the time we actually enter into this arena. That said the time for decisions is coming soon when discussions in earnest start on manufacturing and port facilities.

The purpose here is not to delve into the fixed versus floating discussion but it no harm to note that offshore wind turbines can be mounted on different types of platforms, depending on the water depth, soil conditions, and wind conditions. The most common types are fixed-bottom platforms, which are attached to the seabed by monopiles or gravity bases, and floating platforms, which are anchored to the seabed by mooring lines or cables. Floating platforms can be deployed in deeper waters, where fixed-bottom platforms are not feasible or economical with 60m currently being the depth that FLOW takes over. However, they also have to cope with more complex dynamics and motions, which can affect the turbine loading, stability, and control. The actual tower and turbine and more or less the same so the difference is in the mounting method. So floating can harvest wind in deeper waters and reduces issues with noise and visual challenges that fixed has to endure.

But floating faces challenges and in particular in the harsh environment of the Atlantic ocean of the west coast of Ireland. Challenges such as hydrodynamic, aerodynamic, and structural interactions particularly in severe weather, all have to be catered for. Maintenance is also a challenge as being able to access the units to do maintenance in this environment is a challenge. But it is believed that these will be overcome in the coming years, through innovation, design, and more durable materials. Standardisation and modularisation of floating platform components and systems can facilitate their manufacturing, assembly, and installation.

[10] https://windenergyireland.com/images/files/irelands-offshore-wind-potentialmareifinal120523.pdfYes

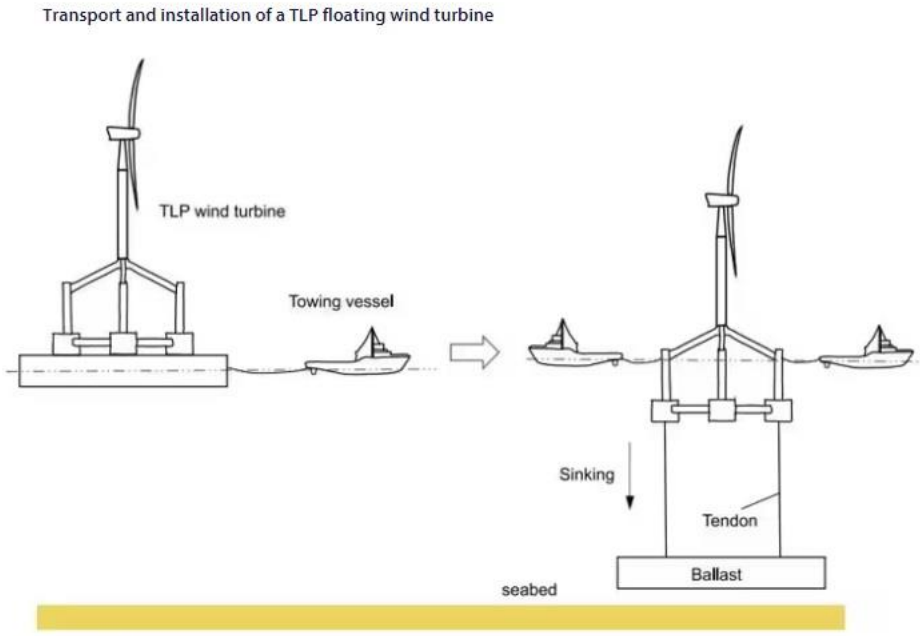
SUMMARY SNAPSHOT STATUS OF FLOATING WIND – CHANGING DAILY!

- Europe is leading the way [98]. Global offshore floating wind pipeline tops 240 GW, but commercialisation will not be achieved until 2030.
- So far Europe has only installed small demonstrator and pilot projects. Together Europe has just over 200 MW. Four projects stand out: Kincardine and Hywind Scotland in the UK (30 MW each), WindFloat Atlantic in Portugal (25 MW) and Hywind Tampen in Norway (95 MW). All of these projects received public financial support. It is the global leader in floating wind and the region commissioned 37 MWs of FLOW in 2023, making up 79% of floating wind additions last year and bringing us to the 208MW mark mentioned above. This is 88% of global installations. [89]
- Biggest site Hywind Tampen, Norway. 94.6MW – provides power to oil and gas installations
- Demonstrator site installed in China (6.2 MW) – one turbine in 2023.
- In addition, first Floating farm in France has just been completed – 25 MW, 40 km west of Marseille and 17 km of the coast in a depth of 100m.
- France tendering 3 sites – one in Brittany and two in the Mediterranean. The two latter sites locations have been announced, will eventually be 750MW's each, both 25 km of the south coast – Narbonne and Gulf of Fos respectively.[166] Plans to award contracts in Summer 2024.
- With regards to the South Brittany site, the French Government announced the winners of the 250MW FLOW site. The winners, a consortium of BayWa re and Elicio, had a winning bid accepted at €86/MWh. It was the first time a country offered a Contract for Difference (CfD) for floating wind in a competitive auction. The 250 MW site will not only be the biggest floating offshore wind farm in the world upon completion. It will also more than double Europe's current floating offshore wind capacity.[167]
- Scotland has huge potential in the floating wind arena. A project called Green Volt, Leading offshore wind developers Flotation Energy and Vårgrønn, a joint venture between Plenitude (Eni) and HitecVision, have announced that their pioneering floating offshore wind project, Green Volt, has been granted offshore planning approval in May 2024. When completed, Green Volt will include up to 35 floating wind turbines, providing up to 560 MW of renewable energy capacity. [168]
- In its Offshore wind net zero investment roadmap launched in March 2023 it spoke about 5GWs by 2030.[169]
- Scotland hopes to add 19.2GWs of commercial floating wind sites over the next 10 years.
- In March 2024 the UK launched a 4.5 GW Celtic Sea floating wind lease auction. The process will complete by March 2025 with three 1.5 GW plots. This development is a significant step towards establishing the UK's first commercial-scale floating wind farms, to be operational by the mid-2030s. [170]
- Salamander, a joint venture partnership between Ørsted, Simply Blue Group and Subsea7, has submitted an offshore consent application for its proposed 100 MW floating offshore wind farm in May 2024.[171]
- In Sweden, Deep Wind Offshore has applied to develop and operate a floating offshore wind project outside Stockholm which will have a capacity of 1.5GW in its first phase.
- Norway, Spain, and Portugal all plan tenders in 2024. Italy and Greece are also to follow suit.
- Spain DemoSATH floating offshore project is now commissioned and supplying to the national grid. Two mile of the Basque cost is supplied 2MW's – it is a 2-year trial. [172]

- Portuguese government has set the capacity on offer, in an auction to be launched by year-end 2023, at 2 GW in three areas off the country's Atlantic coast. [173]
- Ireland is preparing to join in by 2030.
- Activity in South Korea and US also gaining momentum.
- Goto, Japan, Floating Wind Farm delayed by two years following discovery of defects in the floating structure to be used. Initially scheduled for January 2024 but now 2026. 16.8 MW – 8 by 2.1 MW Hitachi turbines on a SPAR type structure. [174]
- Consent granted for project Erebus, of the coast of Pembrokeshire. 7 x 14MW turbines, due in 2026. Partnership of Simply Blue and TotalEnergies.
- UK has big ambitions – 15GWs of leases issued for floating projects.
- Expect Europe to have 3-4 GW of floating wind by 2030.
- To accelerate floating wind technology into the power supply mainstream, several bottlenecks and challenges must be dealt with. Challenges include insufficient port infrastructure and high levelized costs of energy (LCOE).

CHALLENGES AND OPPORTUNITIES FOR FLOATING WIND SNAPSHOT:

- Ports – bigger, deeper, and more in port storage areas required but on land and floating. Comprehensive ports report done by Wind Energy Ireland, [129] flags shortfall in Ireland on this area. Only 2 to 3 potential sites for FLOW on the island.
- Turbines/Nacelles – use the same as fixed and the OEM suppliers will be able to supply more easily. Keep pricing more competitive.
- Potentially environmental challenges less – further out; visual and noise issues gone; face less of the traditional NIMBY ("Not In My Back Yard") resistance from local communities; less damaged to bird population.
- Drag anchors, SEPLA anchors, suction piles, and other anchoring solutions minimise the need for noisy piling installation, posing less threat for fish and marine mammals. They are also easier to retrieve, should this be needed.
- By being farther away from the shore, they have less impact on the fragile coastal ecosystem and the landscape. They also have less impact on other marine users such as fishing, pleasure vessels, and marine transportation. [175]
- Currently Floating Wind is more expensive then fixed bottom wind turbines. Per the Rabobank report referenced here, it is currently 4 times more expensive. However, DNV forecasts a drop in LCOE for floating wind turbines by 74% by 2035 and 82% by 2050. They also conclude that fixed bottom will always be more competitive, but the gap will narrow significantly.[176]
- Shortages of skilled workforce could lead to project delays and missed offshore wind targets- but in the Irish context this could be an opportunity?
- Vessels – different types required but less of an issue as less specialised – turbine assembly in port – tow, anchor, and commission. The process is less complicated and depends on the availability of the above-mentioned, deep-water ports. See diagram below.



Source: Jiang, Z., 2021 (https://doi.org/10.1016/j.rser.2020.110576)

Figure 30 Floating Wind Installation Process [176]

- Governments have to get their core auction right. In an article from WindEurope, they say that governments need to fully index the auction prices to cover inflation between the auction and the actual procurement of equipment. Offshore wind turbine costs have increased by up to 40% over the last 2 years along with the cost of finance. If Governments don't recognise that, they'll lose projects, just like the UK has lost Vattenfall's Boreas offshore wind project.[177]
- Less Environmental Impact potentially.

Per the GWEC Offshore Wind Report 2023 'Taking into account the higher cost of floating wind energy, current challenging economic and financial conditions and expected supply chain bottlenecks in floating wind foundations and port facilities, we have downgraded our global floating wind forecast to 10.9 GW by 2030, 42% lower than the previous year's projection.'

The challenge for Ireland is to take this issue head on and resolve and position itself to take full advantage of the FLOW potential. Remember

CURRENT STATE OF FLOATING WIND

Floating offshore wind is still very much an emerging technology, but it does hold promise and potential solutions for the renewable industry. Wind power in general is seen as one of the main sources of renewable energy. It is seen in many quarters as the means to maximise the renewable input to the energy system and meet national and global targets on GHG free energy. But is not plain sailing with many obstacles in its path, none of which are insurmountable with application and funding, but the timeline is a big question. The sector is grappling with the shift from a handful of single turbine demonstrators to larger scale projects.

It is worth noting that 80% of Europe's offshore wind resource potential is in waters deeper than 60 metres with a total estimated potential of 4,000GW floating wind capacity. The numbers for the US and Japan floating are 60% and 80% of the total of offshore forecast, with 2,450GW and 500GW potential from floating wind capacity, respectively. [176]

It is a new industry with, and as **of 2023, the sector has only 5 installations in place in Europe, which is made up of 32 turbines and a MW capacity of circa 208 MWs**. Hywind Tampen, in Norway, was due to be completed in 2022. Per the GWEC Global Offshore Wind Report 2023, ''11 units of SG-8.6 MW-167 wind turbines from Siemens Gamesa and a concrete SPAR-type floating foundation, was initially scheduled to be completed by the end of 2022, but due to supply chain issues only seven wind turbines (60.2 MW) came into operation.'' The balance was completed in 2023.

Together with Hywind Tampen, one 6.2 MW floating wind turbine supplied by Chinese CSSC Haizhuang, which was installed on a floater prototype called 'Fuyao' in China, to give a total of 66.4 MW floating wind capacity was commissioned in 2022. [178] From a comparison of scale perspective this is against the total of new offshore wind installations in 2022 of 8.771 GWs, which was down from 21.1 GWs in 2021. The bulk of this growth is in China, so relative to Europe, the install base of 208 MW, is still small with 3.3GWs installed in 2021 and 2.46 GWs in 2022.

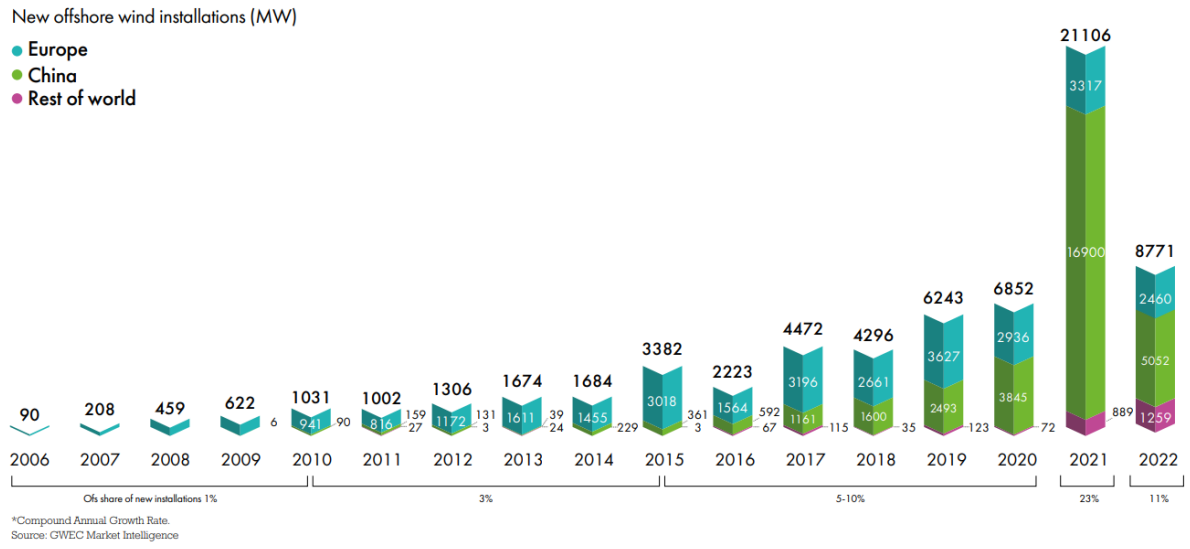


Figure 31 New Offshore Wind Installations up to 2022 [178]

Europe lost its position as the world's largest offshore wind market in 2022 to China, and the UK was overtaken by China as the world's largest provider of offshore wind in 2021. The other top 5 countries are Germany, Netherlands, and Denmark. It is still though fair to say that Europe remains the global leader in floating wind. The region commissioned 37 MW of floating wind capacity in 2023, which was 79% of floating wind additions in the year. This 208MW of European floating wind is 88% of the global installations. [89]

Norway is pushing ahead with their Southern North Sea II wind project area. It will be a floating wind project. There were 7 companies/consortiums who applied for the auction tentatively to be held in February 2024. The auction was planned for 1.5GW of capacity and they are very pleased with companies that have applied. [179]

"Despite large cost increases for the global offshore wind industry recently, there are several strong players applying to be able to participate in the auction round for Sørlige North Sea II. We are now starting to assess the various applications," said Norway's Minister of Petroleum and Energy **Terje Aasland**. [180]

The applicants are:

- **Aker Offshore Wind, bp, and Stratkraft**
- **Equinor and RWE**
- Hydroelectric Corporation
- Mingyang Smart Energy (note these are the largest private wind turbine manufacturer in China – currently developing an 18MW turbine)
- **Norseman Wind AS**
- **Parkwind and Ingka Group (Ventyr)**
- **Shell, Lyse and Eviny**

The reason that this worth noting is that in a time of high costs as a backdrop to the February auction, where profitability is difficult, this reaction is seen as a positive move by the market. [181]

The five sites in the above list in bold and underlined qualified and the auction was won by the Ventyr, the consortium of Parkwind and Ingka Group. The winning bid in the auction was NOK 1.15 (EUR 0.099) per kilowatt hour.[182]

France is a good example of the adoption of FLOW technology by a country with intent to grow this important energy source. In a Norwegian Offshore Newsletter in November 2023 [183], they noted that France had just completed their first floating windfarm, 25 MW, 3 turbine installations in 100m of sea 17 km of the cost of southern France. This is the world's first project to employ a tension-leg floater developed by SBM Offshore in cooperation with IFP Energies Nouvelles. Provence Grand Large comprises three tension-leg floaters, each supporting an 8.4 MW wind turbine generator supplied by Siemens Gamesa Renewable Energy. It shows Frances's commitment to this market and more will follow. France is targeting 18 GW by 2035 and 40 GW by 2050. It is not clear if it is fully commissioned and producing yet but that would bring the MWs available in Europe 225 MW.

As mentioned previously With regards to the South Brittany site, the French Government announced the winners of the 250MW FLOW site. The winners, a consortium of BayWa re and Elicio, had a winning bid accepted at €86/MWh. It was the first time a country offered a Contract for Difference (CfD) for floating wind in a competitive auction. The 250 MW site will not only be the biggest floating

offshore wind farm in the world upon completion. It will also more than double Europe's current floating offshore wind capacity.[167]

As well as France, large-scale floating wind auctions are expected to take place this year in Spain, and Portugal as well. The UK has already tendered sea space development rights for over 15 GW of floating wind.

The offshore wind park consists of three tension leg turbines. PHOTO: EDF Renewables

Figure 32 First Completed French Floating Windfarm [183]

According to 4C Offshore, France is targeting 18 GW by 2035 and 40 GW by 2050. To date, 4.6 GW has been awarded, with 2 GW operational or under construction and ongoing tenders for 3.4 GW. As part of a Sector Deal from March 2022, the government announced further ambitions: Annual tender volumes will be increased from 1 to 2 GW from 2025, 18 GW operational by 2035, and 40 GW by 2050. The government aims to establish an offshore wind map by the end of 2024, allowing allocation of 15.5 GW of new projects in the next 10 years. [183]

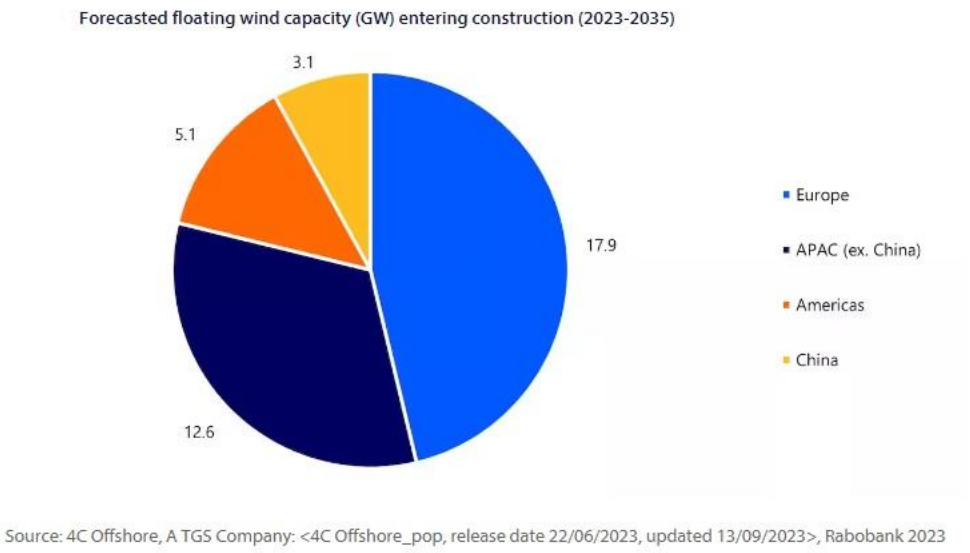


Figure 33 Forecasted Floating Wind Capacity (GW) entering Construction (2023-2035) [176]

Floating wind is therefore very much in its infancy with most of the installations to date in the form of demonstrations and trials as they work out some of the issues. The spread of the installations puts Europe to the fore of the development work, but China has now entered the market and it has shown the ability to accelerate into new areas like this, once it starts.

WindEurope CEO Giles Dickson said: “Floating wind is advancing at a rapid pace. The demo projects have worked. Now is the time to scale-up to large projects…. Floating wind opens up the Mediterranean and other deeper seas to offshore wind. Norway, Spain and Portugal all plan tenders this year. Italy, Greece and Ireland are preparing to join in soon. And the UK has big ambitions. We can expect Europe to have 3-4 GW of floating wind by 2030.” [184]

Europe can be confident it will have 3-4 GW of floating wind in operation by 2030. And it is not unreasonable to think it will have 10 GW by then if Governments back up their expansion targets with the right policies. [184] Ireland has indicated that it will require 2GWs of Floating Wind by 2030 for non-grid purposes as part of phase 3 of its current plans.

BRIEF BACKGROUND TO CURRENT STATUS OF FLOATING OFFSHORE WIND

The history of offshore floating wing is relatively new, but if you think that the first fixed bottom offshore installation was in Denmark in 1991, you could say floating had a head start, has not progressed as quickly.

- The first concept for large-scale offshore floating wind turbines was introduced by William E. Heronemus, professor emeritus of University of Massachusetts, back in 1972.
- 35 years later, in 2007, the world's first floating wind turbine prototype with 80KWcapacity was deployed by Blue H Technologies, 21 kilometres off the coast of Apulia in Italy. It was installed in 113m water depth and was decommissioned after one year.
- A year later in 2009, Hywind, the world's first commercial-scale floating wind turbine with 2.3MW capacity was launched in the North Sea near the Norwegian coastline. It was owned by then Statoil (now called Equinor) and cost around EUR 57m to build and install.
- In 2019, Hywind was sold to Unitech Offshore and its name changed to UNITECH Zefyros. The turbine is still operational and is expected to keep generating electricity at least until 2029.
- A second Hywind project with 30MW capacity was installed off Scotland in 2017, and,
- Two years later, the Windfloat Atlantic project with 25.5MW capacity went operational in deep waters off Portugal.
- After that, the Kincardine wind park was installed in 2020, near the shores of Scotland, with 48MW capacity. In this project, each turbine capacity is 9.5MW. This shows that floating wind turbines can be as big as the fixed-bottom turbines.
- The Hywind Tampen project in Norway, the latest large-scale operational floating wind project went operational in August 2023 with a total of 94.6MW capacity. Electricity generated by this project is used to power oil and gas platforms. [176]

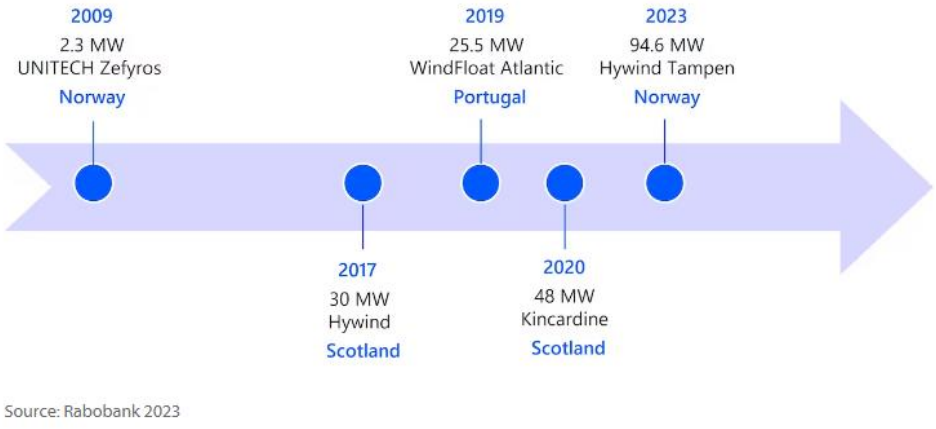


Figure 34 Main large-scale floating wind projects [176]

Currently much of the progress in fixed offshore wind technology is to the benefit of floating. Fixed has tended towards larger turbines and nacelles with 15MWs and higher, coming on line. If the offshore wind farms across both types of installations continue to work with the OEMs and use the same technology, it will save a lot of time and a lot of development work. These demonstration installations have shown that current designs will work, and they can proceed with confidence. Floating offshore wind is still very much an innovative technology, though.

Floating wind installation allows countries with deeper seas (water depths of more than 60 meter) to start doing offshore wind. Europe can be confident it will have 3-4 GW of floating wind in operation by 2030. [177]

IRELAND AND FLOATING OFFSHORE WIND

In the Irish Governments draft Offshore Renewable Energy Development Plan (OREDP II) it sets out that one of the key building blocks in the plan is to strive to deliver a government ambition of at least 30GW floating energy beyond 2030. [185] This is also set out in their Programme for Government. [186] Ireland has a sea area of 490,000 square kilometres – approximately seven times of its landmass – and a seen as one of the best ORE resources in the world.

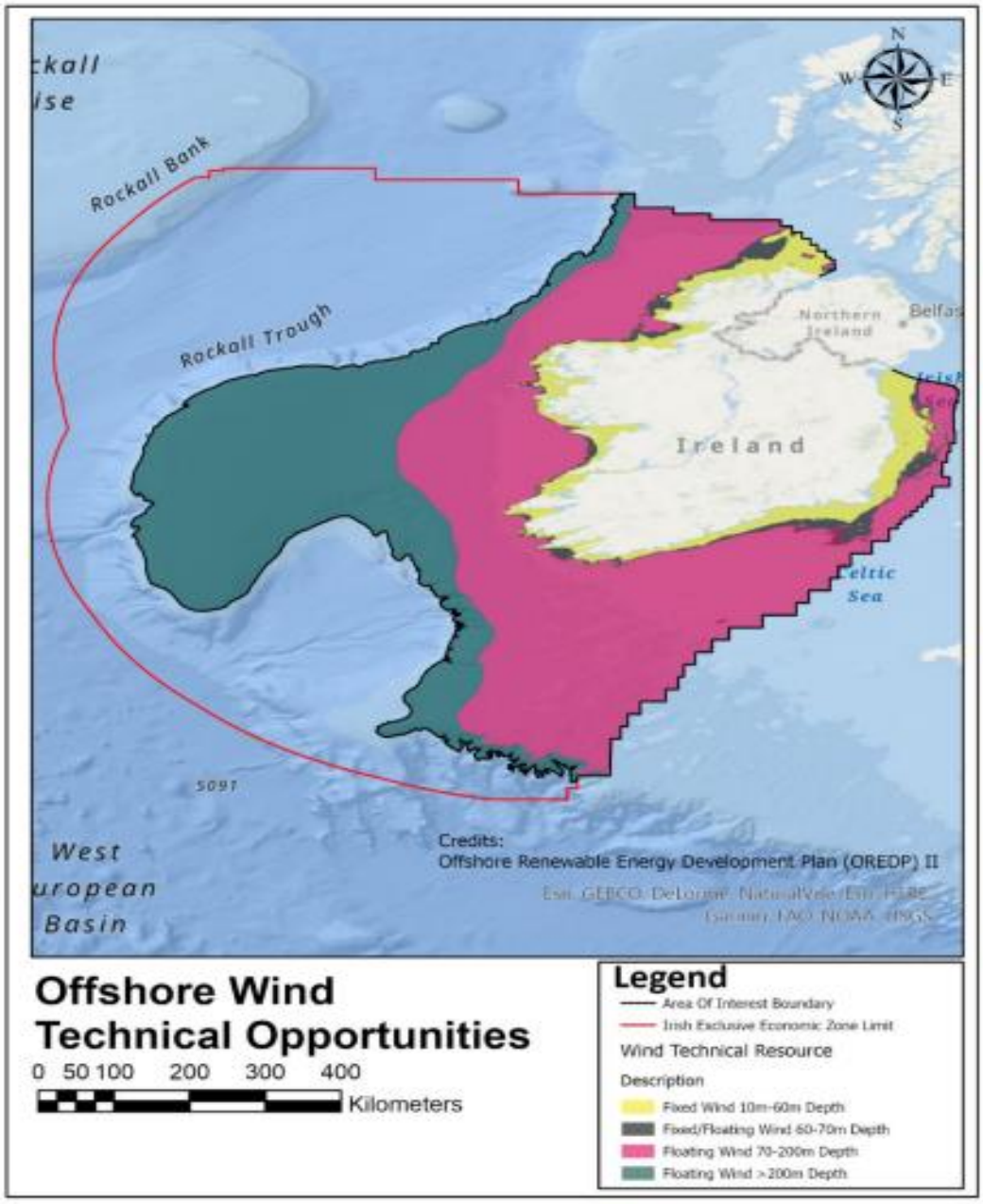


Figure 35 Technical Opportunities for Offshore Wind in Ireland [185]

The Irish Government is in the best place to establish how to balance the use of the marine space within their Exclusive Economic Zones (EEZs) and is taking the lead with its work on the Marine Spatial Plan. [100] The process needs to be collaborative, bringing together users of the ocean and local communities to make informed and coordinated decisions about how to use marine resources sustainably.

There are projects in the development pipeline. In a recent RenewableUK Report, they note a growth of one-third in the global floating pipeline, all at different stages of development. Nearly two-thirds of the floating wind so far being developed in is Europe, with the other noteworthy locations are the USA, the south-east coat of Australia and South Korea. While the report also states the largest pipeline of 40 GW is in Italy, nearly all of the 47 projects are early stages with only one for 90 MW submitted into the planning system. [187]

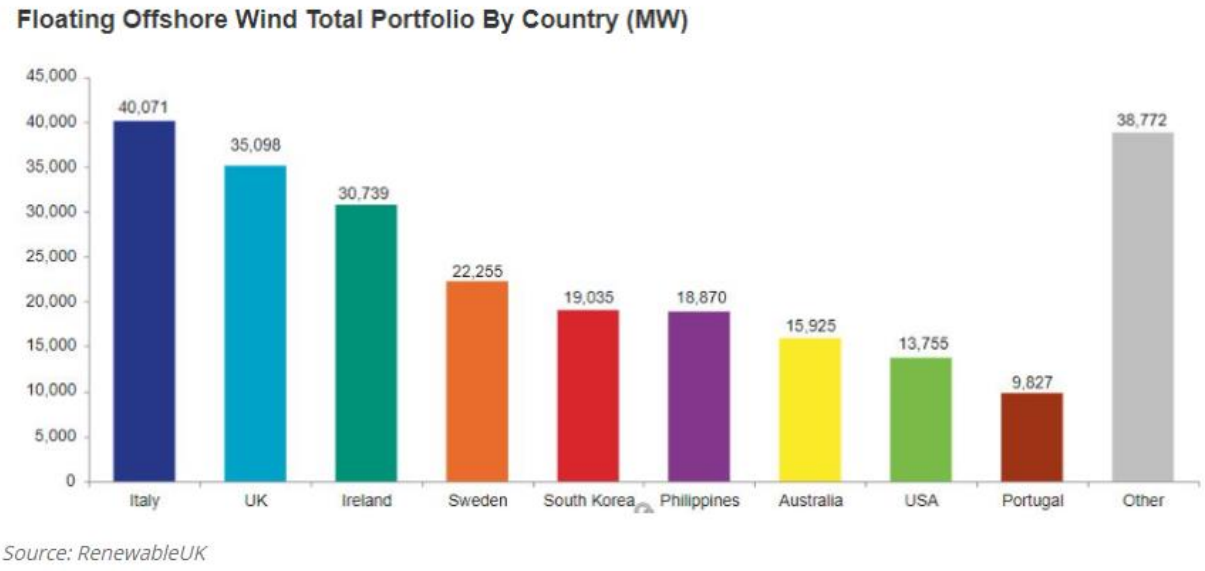


Figure 36 Global Floating offshore wind project pipeline Up by one-third in a year [187]

For Ireland the same report, in the above figure, talks about the 30 GW portfolio for Ireland, and that can be traced back to the Climate Action Plan 2021, when it spoke about a suite of actions to realise the potential of Ireland's offshore renewable energy potential, following the Programme for Government commitments to achieve 5GW of installed offshore wind capacity by 2030 and to produce a long-term plan to take advantage of a potential of at least 30GW of floating wind thereafter. [188] The Offshore Wind Delivery Taskforce had that written into its workstream, but most of that is in a very early phase of planning if at all. In Minister Ryans announcement on the North Sea Energy Cooperation and in the NSEC Tender Planning document [189] [131] it talks about Ireland contributing 5GW (2030) and 20GW (2040) respectively and in the tender it allows for future auctions. These are noted as' FF' – which relates to the Future Framework, which is a strategic roadmap which is slated to be published in the first half of 2024. The announcement says that the strategic road map, from DECC, will focus on:

- Supply Chains – Identification of measures to maximise Ireland's participation in domestic and international OWE supply chain, including an assessment of risks and opportunities.
- RD&I – Setting out the main opportunities for Ireland in leveraging its intrinsic innovation potential as a small, open economy with very strong RD&I pedigree. The ambition is to

develop a globally recognised OWE RD&I ecosystem in Ireland to promote collaboration between SMEs, multinationals, and further and higher education institutes.

Another document mentioned is the publication next year of the Ireland's Industrial Strategy for Offshore Wind by the Department of Enterprise, Trade and Employment.

Between these two documents we should get clarification of what the ultimate mix of fix v floating will be part of the strategy and future framework. One can only assume it will be 30 GW plus.

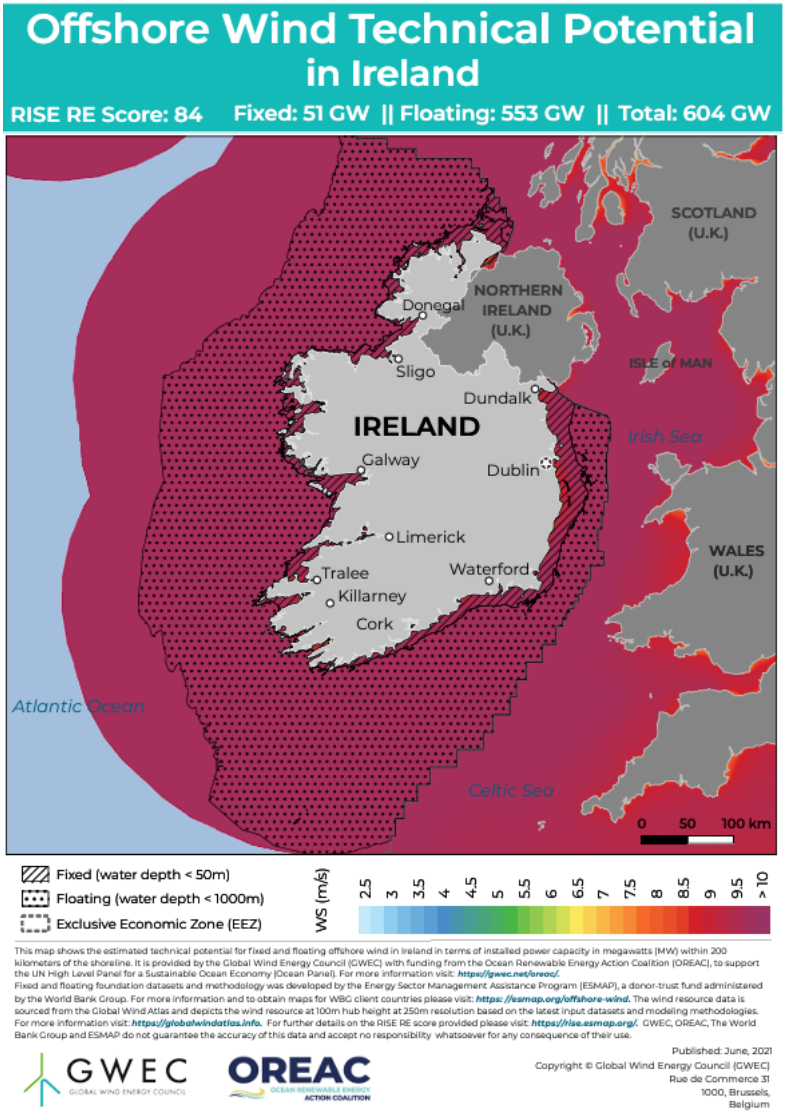


Figure 37 Potential for Wind Energy [165]

Current commercial projects with fixed foundations are limited to a maximum water depth of around 60 m. Deeper waters will be used more in the future as floating projects become commercially viable. Some sources talk of up to 70m, but technically the deeper you go can also be limited by the port infrastructure available and the depth of water in the port area. Today the Levelised cost of electricity (LCOE) of floating wind is much higher than fixed bottom installations, but the installation base is very small. In time and using the same technology as fixed bottom turbines, the gap should close quickly as more and more of floating wind is installed and the supply chain matures. It is estimated that it will me the mid-30's before this equalisation point is achieved or at least close to equalisation.

Floating offshore windfarms in deeper water are likely to be installed in larger volume from the late 2020s. This technology will be vital for markets with good wind resources close to population centres, but with water depths over 60 m. Floating offshore wind will also create new supply opportunities as the deployment of this technology accelerates through this decade. Different floating foundations, installation methods, and cable support arrangements will enable new suppliers to enter the market and help drive innovation. Port requirements for floating wind depend on the foundation concept.

Floating offshore wind projects may require significantly greater quayside water depths; however, the industry is at an early stage and is evolving rapidly. Demonstrator projects using spar foundations, such as the Hywind projects assembled in Norway, have used vertical fabrication and assembly methods partially alongside quays with very deep water (+25 m), followed by final assembly in deep, sheltered areas of fjords (often not available in other markets). Semi-submersible foundation technologies currently under development are likely to need quayside water depths of 14–18 m. Port requirements for floating offshore wind are expected to become more certain in the next five years, as more demonstration and early commercial projects are installed, including in the ScotWind zones, the Celtic Sea, and in the waters of France and Spain.

As stated above the turbine and nacelle design is currently the same as for fixed. The difference between both is the manner in which it is secured in place to the sea bottom. Currently there is multiple designs of floating and fixing methodologies, over 150 are mentioned, but the current thinking is that 3 main types of floating platforms are coming to the fore. These are the Spar, Semisubmersible and the Tension leg platforms. There are others but according to paper by Zhiyu Jiang [190] these 3 are the current thinking

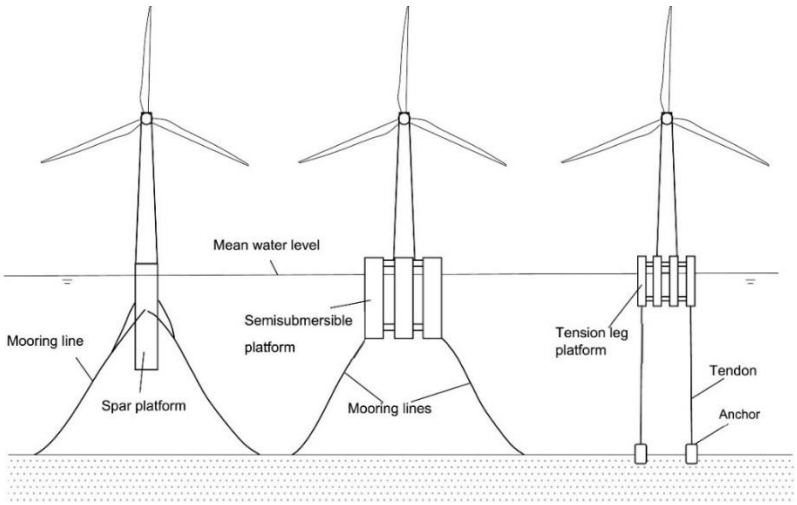


Figure 38 *Schematic of spar, semisubmersible and tension leg platform floating wind turbines [190]*

- Spar platform: a vertical buoyant cylinder ballasted at the bottom with a deep draft that is connected to the seabed with long mooring lines.
- Semi-submersible platforms: consist of three or four columns connected at a distance from each other. These platforms are also anchored to the seabed via mooring cables.
- Tension leg platforms (TLPs): consist of floating hulls made of buoyant columns and pontoons. The hull is holding below its natural flotation level via vertical tendons, usually steel pipes, anchored to the sea floor.

So far, semi-submersible platforms have been the preferred foundation type in the market. [176] In the below figure you can see at a glance the types of structures used in offshore wind and the change in requirement as you go into deeper water. Where the floating structures are shown, based on present thinking, you are at 60-70 meters plus.

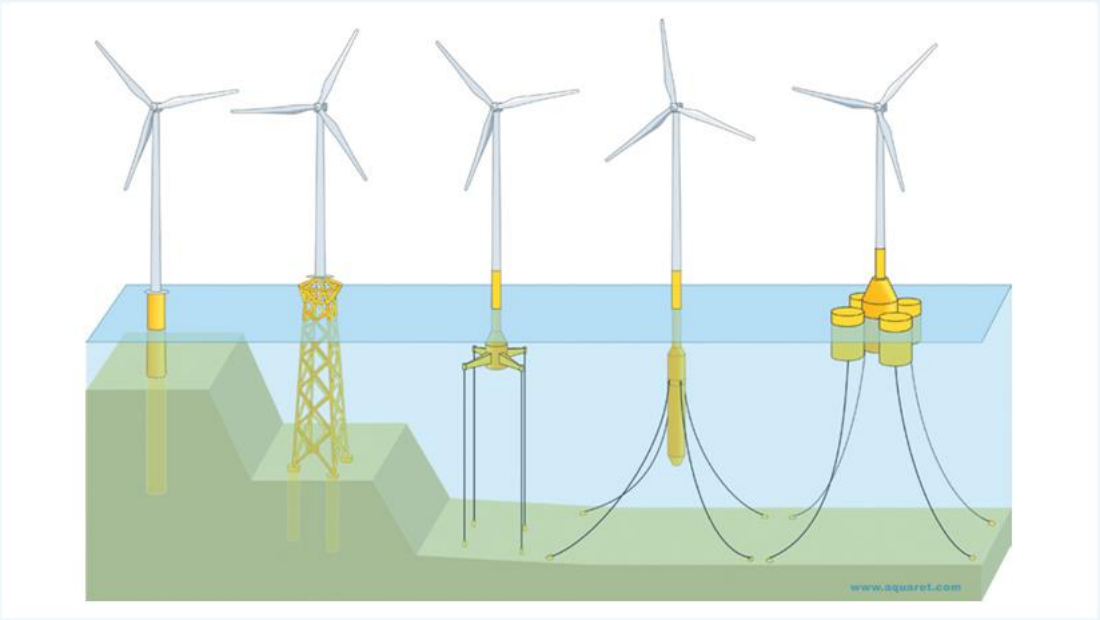


Figure 1: Common fixed and floating offshore wind structure designs (Source: www.aquaret.com).
From left to right: driven monopile; steel jacket tower; tension leg platform; spar buoy; semi-submersible

Figure 39 Progression of fixed to floating wind structures [191]

The technology for the mooring systems comes from the oil and gas industry so in effect it is not new and there a wealth of engineering to draw upon. There will be further innovations for sure. A case in point that Swedish company, Hexicon AB, have developed a TwinHub project which won a contact in the Celtic Sea from the UK government in 2022. This project is expected to be delivered between 2025 and 2027 and it will have two turbines on the one floating platform.

It should be noted that SEAI-funded project has been established to put Irish research to the fore of international efforts to accelerate the development of large-scale floating wind energy (FLOW) farms. The project, named IDEA-IRL: Integrated Design of FLOW Arrays - Ireland will produce a long-term FLOW development roadmap for Ireland, identifying recommendations to maximise its social, economic and environmental benefits. The IDEA project (IEA TCP Wind Task 49) began in 2022, encompassing over 100 organizations from 11 countries. There outputs will be awaited and should benefit how Ireland progresses in this field. [192]

Figure 40 Hexicon AB TwinHub Platform [193]

GLOBAL STATUS AND ACTIVITY

Using the GWEC Global Wind Energy Councils report, below are some direct extracts to give a picture of their global view as of 2023 as a summary.[98] *Note are referenced from the GWEC report unless referenced otherwise.*

- Industry for floating wind still grappling around the challenges of scaling up sites – only small demonstrator sites to date.
- GWEC Market Intelligence predicts that 10.9 GW is likely to be built globally by 2030, 42% less than the previous year's projection. Expect rapid growth in 2030's.
- Over the next five years, GWEC expect to see a small number of 100–500 MW projects successfully built. The next phase of installation for floating will shift to France and China, which between them has 300 MW of floating projects in pre-construction and set for construction towards the end of 2023 or 2024.
- China is also active in floating offshore wind, with the Fujian Nanri Island 4 MW demonstrator and the 16.6 MW Nezzy2 demonstrator both heading into construction shortly, as well as the two 100 MW phases of Power China International Group's PFS-1 Southeast Wanning project. Depending on completion times, this project is expected to become the world's largest floating offshore wind farm, demonstrating China's commitment to floating offshore wind, alongside its unequivocal leadership in fixed offshore wind deployment.
- Goto, Japan, Floating Wind Farm delayed by two years following discovery of defects in the floating structure to be used. Initially scheduled for January 2024 but now 2026. 16.8 MW – 8 by 2.1 MW Hitachi turbines on a SPAR type structure. [174]
- Consent granted for project Erebus, of the coast of Pembrokeshire. 7 x 14MW turbines, due in 2026. Blue Gem Wind is a partnership of Simply Blue and TotalEnergies. First phase in an additional 20GWs site in Celtic Sea. [194]

- Independent studies have suggested that there could be as much as 50GW of electricity capacity available in the Celtic Sea, mainly through floating wind applications.
- The UK has a set of projects in the pipeline, including the TotalEnergies/Simply Blue Erebus project (96 MW), the EdF/TNB Blyth demonstrator (70 MW) and the CIP/ Hexicon Pentland project (100 MW), highlighting the importance of the UK as a place of learning for the global floating market. Two of these were mentioned above.
- The Scottish leasing rounds of ScotWind and Innovation and Targeted Oil & Gas (INTOG) alone account for 24.9 GW of floating capacity, which is approximately one-third of the known global pipeline.
- In South Korea, 14 sites totalling over 7 GW have exclusivity agreements in place via Electricity Business Licences (EBL). The country's major floating wind offshore hub, Ulsan, hosts 13 of these sites. Another 11.9 GW is currently in development around South Korea's coastline.
- In the USA, the Bureau of Ocean Energy Management (BOEM) concluded its California floating auction in December 2022, with four sites given leases totalling 8.1 GW. In January 2023, BOEM published a Determination of No Competitive Interest for a proposed research lease area offshore Maine for a 12-turbine 144 MW floating offshore wind site.
- Norway has opened up its tender process for offshore wind projects for 1.5 GW at Utsira Nord, near Stavanger. The area is suitable for floating offshore wind and permits will be split between three projects of 500 MW, which could be expanded to 750 MW.

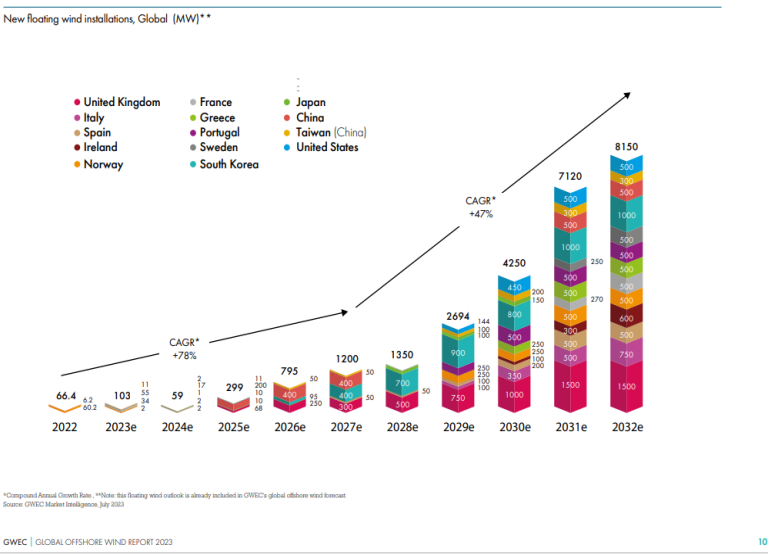


Figure 41 New Floating Wind Installations, Global (MW) [178]

IN FLOW PROJECTS, THE PORT CONFIGURATION IS DEPENDENT ON THE FLOATING PLATFORM TECHNOLOGY

We have discussed previously the types of ports that are required to support both fixed and floating wind projects. The Offshore Renewable Energy Future Framework Policy Statement consultation brought out a scenario where it was suggested that steel construction should be used for the construction of the floating platforms. Currently there is no fixed design for these platforms, and there are over 40 design iterations being considered, all with their merits. There is a view that this approach to the platform manufacture might not be the best for the economy and for employment. What follows is a discussion of steel versus concrete and what the considerations around port construction, would need to be considered. In the consultations Workstream 4 consideration was only given to steel as the key material, whereas in other countries such as the UK, concrete is also being considered due to a 'local' supply line and availability of material.

Concrete in its own right is not seen as an environmentally supportive material, nor is it said to be so, but the merits of the material will be dealt with separately at the end of this section.

The use of concrete has an effect on port planning and construction. The units are much heavier, and the load bearing characteristics of quays are much greater. Ports need some certainty when they finalise their design work and now is the time to future proof the requirements.

If the premiss of accepting the potential use of concrete as a possible alternative to steel in the rollout of FLOW, the impact on ports has to be considered, as well as the flow of the assembly of process the FLOW turbines onto the platforms.

STRATEGY OF THE CONSTRUCTION OF THE FLOW OFFSHORE WIND (FLOW) – STEEL V CONCRETE

Consideration of the potential use of concrete as an alternative to steel in the manufacture of the floating platforms should have been considered in parallel to steel. It would be expected that the

value to the metrics would be higher for the Irish economy and the industry would be more sustainable and self-reliant. It is assumed that a viable design will be in place in time to support the rollout of FLOW.

In the section a very focussed point will be dealt with. The importance is that decisions made on technology, particularly when it relates to port design, will have major implications on port design and the country's ability to be able to support, in this case, the FLOW rollout. If the ports cannot manage the technology in 10 years' time it will seriously hinder any progress that can be made.

There was an assumption made in the Offshore Renewable Energy Future Framework Policy Statement consultation Work Stream 4 (WS4), that steel will be used in the construction of the floating semi-submersible platform for Floating Offshore Wind (FLOW). Consideration does not seem to have been given to the use of 'locally' sourced concrete for the construction of the same floating platform unit. This same discussion could also be extended into the use of Gravity Based Foundations in the installation of the fixed based estate currently being rolled out. Concrete based foundations are used, and for example 71 of this type of unit are being used in the construction at the Fécamp offshore wind farm site in Normandy, France. [195] This is a current project. An opportunity to delve into the plans of the 4-winning tenderers in ORESS 1 has not be possible at this point, but the logic and approach to the use of concrete in supplying these base units is the same.

WS4 states the following – 'In all scenarios, it is assumed that modular foundation components are manufactured elsewhere, before final assembly in Ireland. Ireland has little of the type of heavy manufacturing industries which would carry out this work, and there is no strong logic for local supply as components are designed to be transportable. We assume Ireland will not be an investment location of choice for new facilities of this kind due to its existing capability coupled with relatively high wages, which mean investment will more likely flow to other markets.'[88] This assumptions has a knock affect job creation, port set up and the ultimate return to the exchequer.

Based on this assumption the main component parts for the construction will be steel and while the assumption is correct when it comes to this material, consideration should also be given to the use of concrete in parallel and the models run to see what the metric benefits are arrived at and how they compare.

Ireland does not have a steel industrial infrastructure of this size and is potential not the route that should be followed. While in particular on FLOW, there are many designs being worked upon with no clear direction being taken yet, designs will evolve in the coming years and there is a good chance there will be a viable concrete one when that a consensus arrived upon.

WHAT IS THE CASE FOR CONSIDERING CONCRETE?

Norwegian company called NorSea Impact AS commissioned consultants DNV, a leading consulting firm and certification body, to carry out a comparative study of concrete and steel substructures for Floating Ocean Wind Turbines, for a project they are looking at. It looked at both a spar and semi-submersible constructions and the study indicated the concrete floaters have a lower carbon footprint and costs then their steel counterparts. [196] They assumed that the only location that could supply the volume of steel required at a competitive price was China and that still seems to be the case. A point to note is that the current war in Ukraine escalated (February 2022) around the time of the report being launched and since then the price of steel has again increased. This would certainly have influenced further this report if the war had been factored in.

The report found that there would be a skills deficit in Europe to meet the volumes required for the project being assessed which was 67 units per year, similar or slightly more to a potential volume in Ireland. It concluded that Asia and in particular China offered the only potential for supply.

The report also concluded that the ability to manufacture these units existed in Norway, where the report was commissioned. It said that 'it is found that the local labour and supply chains within Norway can meet the majority of the demand generated during full production of concrete spar or semi-submersible units…. The labour and skills market has capacity to cover all positions and expertise locally.' But not the supply of the steel, the raw material.

The supply line from China is also a considerable factor to note and the DNV report found that the carbon content of steel some 2.5 to 3 times higher for steel over concrete. The report delves into various hybrid solutions and examines the life cycle aspects and the inclusions of recycled materials, but still concludes that the carbon footprint is lower in concrete based units.

Just like concrete, there are many issues affecting the role of steel construction in FLOW. Depending on when the reports are published - one report has costs in offshore wind projects up some 57% (August 2023). [197] Fortune Magazine says that soaring materials costs, particularly for steel, forced turbine makers to raise prices. [198] But it also important to note that cement has also gone up in price, but the difference for us here in Ireland is that it can be sourced on the island of Ireland along with most of the other materials required in the manufacture of a concrete semi-submersibles. With China there is also large transport costs and possibly delays in delivery which you do not have with local sourced products. The carbon footprint of the transportation is also a factor to be noted.

It is also important to note that with the introduction of EU Carbon Border Adjustment Mechanism (CBAM) will affect the import of steel and steel components from outside the EU. [199] CBAM is designed to prevent 'carbon leakage' by imposing a carbon levy on specific product imports from non-EU and non-EFTA countries. The levy is linked to the carbon price payable under the EU Emissions Trading System (ETS) for the same goods produced within the EU. As of now, **it does apply to steel**. It is an attempt to control the import of carbon emissions from outside the EU without additional cost and mitigation steps been taken. This was not a factor taken into consideration in the DNV report, and the implementation of CBAM started on a transitional phase on the 1st of October 2023. CBAM has initially been applied to iron, steel, aluminium, cement, electricity, fertilisers, and hydrogen. All good reasons to look for solutions from within the EU. Reporting only, started on this date, but the financial side comes into play in 2026. [200]

The UK ORE market is one of the leading global markets in the world at this time. It has one of the most extensive portfolios of installations, mainly fixed bottom at this point. But it has ambitious plans to rollout FLOW into its UK wates in the coming years. It too, is looking at issues around concrete as an alternative to steel platforms. RenewableUK's Floating Offshore Wind Taskforce in its Industry Roadmap 2040 report, in March 2023, looked at building the UK Port Infrastructure required to support the rollout of FLOW. It ran both the steel and concrete as potential scenario's and was agnostic to the solution that would actually use.[125] While it looks at both solutions with merit it does not recommend one solution over the other, but recognise concrete as a viable solution.

The report recommends that more work is required as set out below and considering the history of the UK in heavy steel fabrication against Irelands history there is skills deficit here, at this time.

''The feasibility and attractiveness of concrete substructure should be further investigated. Further investigation in the feasibility, attractiveness, and UK benefits of developing concrete substructures as a viable solution for FLOW. To get more clarity on the concrete manufacturing port

feasibility and infrastructure requirements, the UK's potential for concrete construction needs to be better understood.

At first glance, it is expected that lower investment will be required due to the UK's existing industrial base for concrete solutions in other sectors. Additionally, it will also unburden steel supply and associated skill requirements as there will be healthier balance between the use of steel and concrete in the UK market. The question remains if concrete is going to be a widely used as the accepted solution to condone further development of infrastructure and skills.

Investigate the feasibility of modular and standard based steel substructure fabrication in the UK. UK steel substructure fabrication facilities are required to service and secure UK deployment ambitions but can only be developed on the back of highly modular and based on standard components. Standardisation of steel structural components (e.g., tubes) by designers across the industry would greatly assist the industrialisation of the fabrication industry in UK.

Multiple steel fabrication locations will be required in the UK to supply FLOW steel assembly ports; these can feed in to one or more assembly location. Considering the increase in demand from FLOW, the UK would need to bridge the gap with existing European assembly capacity.
British ports and fabricators are unlikely to be able to compete with suppliers in the Far or Middle East in terms of infrastructure scale and labour cost, but with the high cost of transport there might be a case for securing supply, speciality fabrication and the value added via indigenous strengths in areas such as modern high-end automated welding must be prioritised.''

In theory the same consideration could equally apply to Ireland, but in the Irish case from a skills perspective the deficit is higher. In WS4 of this consultation it would have been important to see what the value in terms of GVA and FTE would be if the concrete solution was run in parallel to steel.

IS CONCRETE NOT A THREAT TO THE ENVIRONMENT?

Concrete manufacturing emits a high level of carbon dioxide each year. Portland clinker – cement's key binding ingredient – accounts for over 90% of those emissions. But there are alternative binders that are safe, scalable, cost-effective, and – above all – climate-friendly. [201] There has been difficulties in the EU's Emission Trading System to cater for these alternative materials, but it is hoped it will be sorted for 2026-2030. The cement industry is also a source for green hydrogen to be used in the kilns to enhance cements green credentials again further.

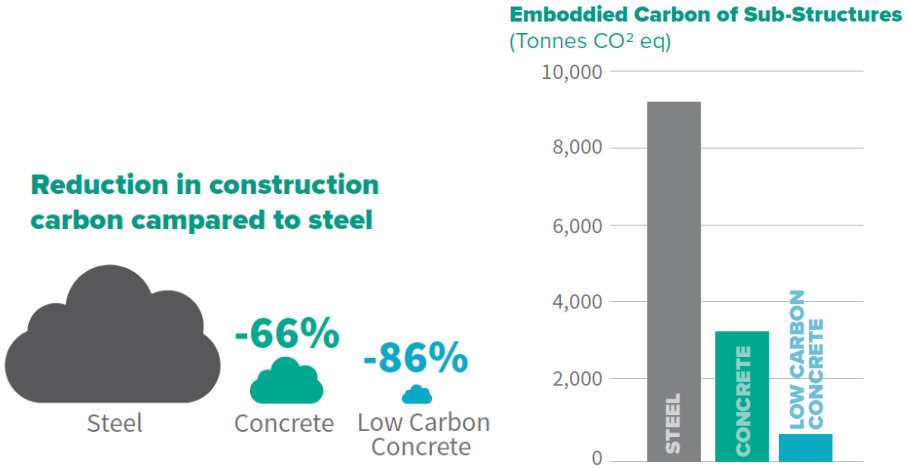
Concrete is said to account for 8% of global emissions and rising and it is one of the hardest to abate. CO_2 emissions from cement production cannot be removed with classic approaches, e.g., fuel substitution or electrification, because CO2 is an unavoidable by-product of the calcination reaction that transforms limestone into CO2 and calcium oxide, the essential component of cement. In addition, the high temperatures needed to kickstart the reaction are generally achieved by burning fossil fuels, hence producing additional CO2 emissions.

Eu legislation drive by Fit for 55, which is the EU's target of reducing net greenhouse gas emissions at least by 55% by 2030. The package brings EU legislation in line with the 2030 goal. This came into play in 2023 and is now rolling out into member states. [202] This will put a lot of pressure on the industry to come up solutions and could in effect assist in the discussion around concrete being a solution for FLOW platforms.

With cement 90% of the emissions comes from the production of clinker, the primary strength-contributing ingredient of concrete. In accordance with the Paris Climate Agreement, the global

concrete industry must reduce emissions by 16 percent by 2030 and 100 percent by 2050 to stay within the 1.5°C warming carbon budget. It is a major challenge for the industry. Initiatives around alternatives to clinker, other additives, using green hydrogen and other ideas are being explored by the industry, so in advocating concrete for FLOW, by 2030 it would be hoped that the carbon footprint will be considerable reduced. [203] [204]

A UK report in 2023 on behalf of the Cornwall FLOW Accelerator – Concrete for Celtic Sea Flow, it outlines a regional concrete plan for the south east of England. It says that with sub-structures being the single highest value component, they present a realistic route to capturing desired levels of local content and maximizing socio economic gain for the region. But the focus on carbon emissions is a useful insight as demonstrated in the following diagrams which are self-explanatory. [205] Even though concrete is port from an embodied carbon perspective, steel is worse than concrete.



[205]

There is work been carried out in other countries such as France, Norway, Italy, and Spain, without exploring China and the Far East, on the use of concrete as a solution. An example would be Norwegian company Plav Olsen's 00-Star Wind Floater concept. [206] There are also many technical studies being carried out as there is much research ongoing.

There is no concrete design fully approved and ready to go as of yet, but work is ongoing and potentially a hybrid of solution is ultimately decided upon as a workable solution. But there are a number of UK reports published and there is much discussion this topic and suggesting the use of concrete as a solution for offshore platforms. There are barge designs and semi-submersibles, as well as the spar design, the latter probably not suitable as it needs deeper waters to be built in, then our potential ports have available. RWE funded a study by Catapult to look at Manufacturing Concrete Floating Wind Foundations in Scotland in 2021. [207] It is fair to say that the floating wind substructure designs are typically based on concepts used in the offshore oil and gas industry. There is a lot of firsthand experience of these structures in Scotland. 'In the context of the rapid growth of the floating wind market in Scotland, this study seeks to understand the potential for the Scottish supply chain to manufacture concrete floating offshore wind substructures.' It concluded that Scottish supply chain had sufficient capacity in most areas, including the supply of ''lower carbon concrete''.

The following summary table from this Catapult Report, very much could be equated to what the capabilities in Ireland would be. Ireland has 4 companies that manufacture cement currently and Low Carbon Cement (LCC) will be available in quantities in the coming years, in line with EU

requirements to get to net zero. There are aggregates available in Ireland and there is some rebar manufactured. What capacity of rebar that would be available is unknown but could be addressed, within the project timeframe. Formwork skills are available, and the post-tensioning skill availability is unknown at this time to the author. In comparison to steel fabrication, the skillsets required for these concrete units, are different and probably more readily available then the steel fabrication skillset or could be more easily provided for through training. Ireland has always had a strong and robust construction industry. This is an industry, based on the current Irish plans for FLOW, that has a life of some 20 plus years and beyond assuming that the repowering of the offshore windfarms continues into the future, beyond 2050.

	Could be fully sourced in Scotland (in baseline scenario)		Comments
	Now	2030	
Aggregates	Yes	Yes	• The baseline scenario is estimated to use ~30% of Scottish crushed rock aggregate supply. • There is significant logistical benefit to local sourcing.
Cement	Yes	Yes	• Carbon allocations influence cement production volumes. • Some lower carbon cement constituents are currently imported but are likely to be available in the UK by 2030. • A number of Scottish companies are already committed to net zero cement by 2050 and there is progress locally and globally on innovation to achieve this.
Rebar	Partially	Likely	• Only one rebar producer with sufficient capacity is available in the UK (Cardiff). The baseline scenario would use 10% of Cardiff producer's capacity. • The baseline scenario would exceed the current Scottish rebar supply capacity by 100%. • On-site facility for rebar cutting and forming would need to be set up at port.
Formwork	Likely	Yes	• Scottish-based suppliers would be able to supply for precast options. Slip forming (where required) would need specialist skills and rigs that are not currently manufactured in the UK.
Post-tensioning	No	Likely	• Currently no domestic supply in Scotland but inward investment likely with sufficient demand.

[207]

Another Catapult report completed for the Welsh government demonstrated that in a comparison between both steel and concrete, concrete created more employment of the magnitude of 10% plus based on installing 1GW per annum. The table below is extracted from the report. [208] It also talked about supply line issues with the steel fabrication, the high skill that was required and that the security of supply offered by construction of concrete units.

All these reports come with the point that the design for a concrete floater has not been totally validated as of yet but should have been considered as part of the workstream.

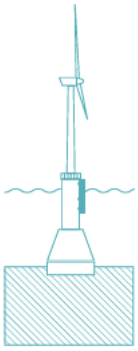
Direct FTE	Units	300MW South Wales	1,000MW South Wales	300MW North Wales	1,000MW North Wales
Steel Semi-Sub Substructure Assembly	FTE	305	684	305	684
Concrete Semi-Sub Substructure Assembly	FTE	362	747	362	747

[208]

Note the number of jobs will increase as the volume of installations will possibly be of the order of 2GW's and these semi-submersible units will be made in more than one construction port – possibly two or three.

It would be insightful to see the comparison of this locally sourced solution to the platform translate into the GVA and FTE figures as the supply more or less in totally on the island of Ireland, modelled as part of Work Stream 4. There is no reason or explanation given in the documentation that has been found.

The use of concrete in the fixed wind turbines in the initial phases of the Irish rollout following the ORESS 1 auction is also a possibility, but the details of the plans for the deployment presently are unknown. There is a gravity-based foundation made from concrete that is a possibility, there is no comment to be made at this point. The use of gravity-base foundations for installation of offshore wind turbines offers a potentially low-impact alternative to traditional construction methods for wind turbines such as pile-driven monopile and/or jacket foundation installations. [209] These are normally made from concrete and would be built portside in a construction port. Gravity Base Structures are the oldest and simplest foundation type, relying on the weight of the ballasted concrete base to provide stability. The volume of materials needed for depths beyond 35m makes them very expensive for deep-water sites. The fabrication and installation requirements are totally different to other fixed bottom foundations.



Suitable for depths of 15m to 40m[11]

There are many references discussing the benefits gravity foundations such as a recent one from Newcastle that found that they are potentially a marine-friendly future for wind turbines. [210]

The recent French installation at Fécamp Offshore Wind Farm used 71 concrete gravity-based foundations in depths of 25 to 30 meters and weight 5,000 tonnes each. [211]

Wind Energy Ireland in their 2020 report Harnessing our Potential said that concrete structures (e.g., gravity-based structures) are more amenable to local production, due to the challenges of lifting and transporting them between different locations. Concrete fabrication facilities require comprehensive facilities that may require considerable up-front investment. A large pipeline of projects is usually required to justify such investments; this is not likely to occur as the use of concrete structures is decreasing. [12]

[11] https://www.empireengineering.co.uk/wp-content/uploads/2021/08/The_Empire_Engineering_Guide_to_Offshore_Wind_Foundations_eBook-1.pdf
[12] Https://windenergyireland.com/images/files/final-harnessing-our-potential-report-may-2020.pdf

Has consideration been given to the use of concrete gravity-based units in the rollout of ORESS 1 sites or considered in the work stream deliberations? It is another opportunity to bring jobs into Ireland rather than export them overseas. If there is potential for gravity-based foundations not data could be found at this time.

If concrete is considered for the FLOW installations, there are considerations that have to factored into port planning and will only be mentioned here briefly:

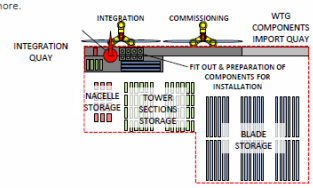
- In the Offshore Renewable Energy Future Framework Policy Statement consultation, it mentions Belfast as the only port available on the island of Ireland to support the early phases of the ORE rollout, for fixed bottom windfarms and some potential for FLOW. Building UK Port Infrastructure to Unlock the Floating Wind Opportunity is one report that considers Belfast as part of the UK solution. [125] Belfast is also considered as a resource for the UK rollout of ORE. Has the unavailability of Belfast been examined and what the effects on the plan for the rollout in Ireland? Consideration of the work ongoing progress in Rosslare [145] and the potential of Bremore [143] looks like the only two viable solutions for the east coast rollout on the island, before consideration is given to going to already potentially busy ports in the UK or in the likes of the Netherlands.
- Belfast seems to be only a solution for fixed bottom installations because of port limitations currently. That said the above UK report suggests that it could contribute to the UK FLOW programme.
- In the previously mentioned report by RenewableUK, Building UK Port Infrastructure to Unlock the Floating Wind Opportunity, [125] , they consider three port types in their considerations as per the diagram below. There is much detail in the report but if the same approach was taken to Irish ports, there will be a number of manufacturing and installation ports identified, depending on the rollout volume. The manufacturing ports will be an all-year-round operation and can manufacture 12 months of the year. Both type of ports (concrete and steel) will manufacture a similar quantity per year and do not need to be co-located with the installation ports, but operationally co-location would be beneficial.
- In considering concrete as a solution a port will require a longer quay length. This is a limiting factor but as ports are being developed it is a consideration that must be factored in. The importance of this is for example, looking at the Foynes Development from the outside, and with the location of the cement plant near the Shannon estuary, allows for the opportunity to manufacture potentially close by. If there is a manufacturing in the estuary and the opportunity now to develop this aspect accordingly there should be the ability to assemble the floating unit with turbine and all, within an installation port in the estuary and doing it portside. The aim has to be to do it portside and should be part of the Future Framework policy, linking into the new Port Policy. The Future Framework document seems to imply that this ability will not be available in Ireland until 2038 and to wait for this facility to be available seems very long and should it not be earlier?
  It would be hoped that Cork could also be on line as well as Foynes, for floating, and any other suitable ports as required. Rosslare and Bremore would be fixed based units only it would seem.
- From a port perspective there are challenges with Concrete over Steel when it comes to your ports structure, but all can be overcome with a clear and **PLAN LED policy**, indicating the direction of travel. Ireland needs a port strategy and plan for this national project. It should not be left to individual ports to develop their own plans without the certainty of a national plan. The RenewableUK, which reflects similar thinking to other previous mentioned reports when it comes to ports - Manufacturing concrete floating wind foundations in Scotland [207], Floating offshore wind sector report: non-technical summary | GOV.WALES [208], and Concrete Position Paper 2023', Celtic Sea Power [205] **Where is the Irish National Plan?**

Critical port types

The key port requirements give an indication of the long-term dimensions to service large scale FLOW deployment. These dimensions can be the result of ports evolving over time to assure they grow with market scale and are future-proofed. **Existing ports with known parameters and sufficient supporting capacity (tug, cranage, launch facilities) could work with lower channel widths and reduced depth requirements, as circumstances and actual requirements are very site specific.**

Integration port

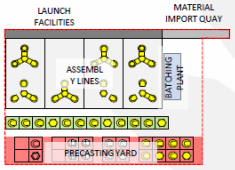
An Integration Port is a facility in the vicinity of the wind farm used to install the wind turbine on the substructure prior to deployment offshore.



KEY REQUIREMENT[1]	17MW	20MW
Distance from Wind Farm (km)	265	265
Entrance Width (m)	120	130
Air Draft (m)	Unrestricted	Unrestricted
Access Channel Width (m) [1]	230	260
Access Channel Water Depth (m below MLWS)	15.0	16.5
Landside Area (ha)	20	25
Integration Quay Length (m)	400	440
Integration Berth Water Depth (m below CD)	15.0	16.5

Concrete manufacturing port

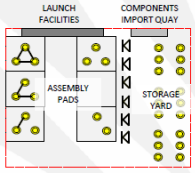
A concrete manufacturing port, which can be further away from project sites, is a facility where concrete substructures are manufactured and assembled.



KEY REQUIREMENT[1]	17MW	20MW
Entrance Width (m)	120	130
Air Draft (m)	50	50
Access Channel Width (m) [1]	230	260
Access Channel Water Depth (m below MLWS)	13.0	14.5
Landside Area (ha)	30	40
Launch Quay Length (m) [2]	520	560
Launch Berth Water Depth (m below CD)	8.5	8.5
Manufacturing Duration for Substructure (wks)	13	13
Number of Assembly Lines (No.) [3]	4	4

Steel assembly port

A steel substructure assembly port, which can be further away from project sites, is an intermediate facility used to construct steel substructures before being transported to an integration site.



KEY REQUIREMENT[1]	17MW	20MW
Entrance Width (m)	120	130
Air Draft (m)	50	50
Access Channel Width (m) [1]	230	260
Access Channel Water Depth (m below MLWS)	13.0	14.5
Landside Area (ha)	30	40
Launch Quay Length (m) [2]	275	275
Launch Berth Water Depth (m below CD)	8.5	8.5
Assembly Duration for Substructure (wks)	6	6
Number of Assembly Pads Required (No.) [3]	6	6

	Concrete manufacturing port	Steel assembly port
Port infrastructure	▪ Similar entrance, landside requirements ▪ **Higher bearing capacity requirements due to heavier substructures (circa 20,000t)** ▪ **More onerous landside transportation requirements** (i.e. skid transfer rails) due to higher loads	▪ Similar entrance, landside requirements ▪ Lower bearing capacity requirements due to lighter substructures (circa 4,000t) ▪ Components and substructures can be transported utilising SPMTs ▪ Noted that quay facilities are dependent on geometry of site and supply chain logistic and therefore are not considered a significant differentiator
Launch & depth	▪ Similar access channel and launch berth water depth ▪ **Careful consideration of how substructures are moved to quayside** is required to prevent bottle-necking of production lines	▪ Similar access channel and launch berth water depth. ▪ Noted that steel substructures are lighter than concrete structures and therefore **lesser water depths for steel substructures may be acceptable** provided that they have adequate stability at these draughts.
Supply chain needs	▪ Lower skills threshold with **more opportunity for workforce to move from existing buildings and civils construction industry** ▪ **Benefits from local supply** of raw materials for concrete production ▪ **Production is likely to take longer** but can utilise production lines for efficiency	▪ **Higher skills threshold for welding and steel assembly operations** ▪ Components imported from fabrication facilities either nationally or internationally

[125]

It is important to remember that these concrete units are up to 20,000 tonnes so the load bearing ability of the port is a key consideration.

PUBLIC CONSULTATION TO INFORM THE REVIEW OF NATIONAL PORTS POLICY IN IRELAND

Dear Minister Ryan & the Department of Transport Office Team,

As Assistant Professor of Dublin City University, 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 research projects with Irish & EU academic & industry partners and government bodies such as Science Foundation Ireland & Sustainable Energy Authority of Ireland (SEAI).

I am a FEL alumina of the World Energy Council & 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.

I am a task force advisor to the IEA on Energy Storage.

I am co-founder and outgoing chair of Hydrogen-Ireland. 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.

Myself & my research team in SFI funded projects HyLIGHT & NexSys have developed the following section for your information and review. We hope it assists our country's energy, transport and industry sectors energy transition and national emissions reduction ambition/achievement.

I am available to be contacted to clarify any topic or answer any questions you may have.

Kind Regards,

Dr James Carton

Assistant Professor in Energy & Sustainability & Hydrogen

Mechanical & Manufacturing Engineering, Dublin City University

Bill Duggan MSc

Offshore Wind Energy Expert & Researcher

Mechanical & Manufacturing Engineering, Dublin City University

Executive Summary:

The following is a reply mainly to Section 2: Development of Offshore Renewable Energy

1. There are many active Offshore Renewable Energy (ORE) policy, strategies, and legislative initiatives being progressed by various government departments. The kernel of all ORE activity; **is the port system capable of ensuring the delivery of a port structure that can function and co-exist with ORE.** This Port Policy should draw these strands together.
2. The North Sea Energy Cooperation (NSEC) joint statement in 2022 [3] committed to accelerate Europe's move towards energy independence. **The nine NSEC countries, Ireland being a member, have agreed to reach at least 260GW of offshore wind energy by 2050.** This increases the urgency of Ireland delivering on its commitments.
3. '**Ports serve as indispensable hubs in the expansion of offshore wind energy and the energy transition**' [7]. Ireland needs at least 2 Ports to cover the full wind energy value chain in the immediate near term. The review document mentions a multi-port solution, though not necessarily wrong, but the realisation that specialisation for fixed bottom initially and floating wind should be planned in to specific strategic port/s now for immediate implementation in this policy.
4. **There are no port in the ROI capable of deploying ORE**. Belfast is the only port on the island that can support fixed bottom installations at this time, [9], with the other option to use other UK or EU if available to us. This should be a priority to solve, for economy and jobs and energy security.
5. If Ireland wants to do most of the main offshore wind activities in its own ports, a **total investment of €2-3 billion** would be required.
6. Reports quoted in the *Issues Paper* for this multi-port approach need updating:
    a. IPORES 2018 is in need of updating as **the technology and volume of product to be installed has increased rapidly**, [9], thus influencing the outcomes.
    b. The Irish Ports Capacity Study issued in 2023 by Arup **does not account for the co-existence of ORE at Irelands ports**, where facilities and space need to be shared.
7. The **competition for space** at ports to support the ORE industry and normal port activity is at a premium. **Blades are now 240m long weighing 65tonnes each and nacelles weigh 500tonnes each.** ORE is space hungry, and the policy document needs to future proof Irelands ORE designated ports to future proof them to remain sustainable as the rollout, particularly of offshore fixed wind on the east coast and floating wind on the west coast is maximised.

8. The timeline of completion of National Ports Policy in Ireland by Q2 2025 needs to be review as the **issuing of the new Ports Policy is a matter of urgency** if we are to deliver on Irelands national commitments and reap the economic benefits through employment and added value work done at port.

Section 2: Development of Offshore Renewable Energy

QUESTIONS 1 - *What policies, structures or other measures would best support ports to develop the infrastructure necessary for the facilitation of ORE?*

Ireland, who was an early adaptor of Offshore Renewable Energy (ORE) with the installation of the 25MW's of wind turbines on the Arklow Bank in 2002, has now ambitious targets set out in its Programme for Government [186]. The Government has committed to reaching 5 GW target of offshore win by 2030, with an additional 2 GW for non-grid connected capacity, due to be realised after 2030, the latter is expected to be floating wind (FLOW). Ireland sits on one of the best offshore renewable energy resources in the Europe and also possibly the world, with a sea area approximately 7 times the size of its landmass. This has the potential to deliver in long term potential some 70GWs of offshore wind, mainly on the west coast.

The opportunity to input into this consultation through the Review of National Ports Policy 2013 is welcomed. While this review and consultation is being led by the Department of Transportation (DoT), there has been numerous aspects of ORE being addressed through government strategies, policies and legislation to lay the ground work to ensure a robust ORE industry can be developed. Such activities by department are listed below. All these and some others touch on the need for a port structure to support Irelands climate change commitments.

- **Department of the Environment, Climate and Communications (DECC)**
  - Climate Action Plan 2023
  - Policy Statement on the Framework for Phase 2 Offshore Wind 2023
  - Offshore Renewable Energy Development Plan II (Draft) 2022
  - National Hydrogen Strategy 2023
  - Accelerating Ireland's Offshore Energy Programme – Policy statement on the Framework for Phase Two Offshore Wind 2023
- **Department of Enterprise, Trade and Enterprise (DETE)**
  - White Paper on Enterprise 2022-2030
  - Statement of Strategy 2023-2025
  - Public Consultation on the Development of a National Industrial Strategy for Offshore Wind 2023 – leading to a strategy document.
- **Department for Housing, Local Government and Heritage (DHLG&H)**
  - Marine Planning Policy Statement 2022
  - Maritime Area Planning Act 2021
  - National Marine Planning Framework 2021
  - Foreshore Act 1933 revised 2023
  - Planning and Development Act 2023 currently in the Dail.

All of these strands have a role in the formation and the delivery of a coherent, connected and succinct policy document which when it comes to ports, the output from this consultation needs to blend the strands together.

The Department of Transportation (DoT) has issued this consultation on the National Ports policy, and it is a welcomed opportunity to take a holistic view, but in talking of ports specifically, the ability of the ports to delivery Ireland's global connectivity and at the same time act as one the key delivery vehicles of Ireland ORE deliverables, and the policy needs to knit together as one. In the DoT's Statement of Strategy 2023-2025 [128] while the delivery of ORE is mentioned, greater emphasis, understandably,

is given to connectivity, this submission would advocate for a equalisation of emphasis and co-sharing of Ireland's valuable port facilities.

The first requirement of Irelands port infrastructure is to deliver its primary role of ensuring connectivity with Irelands global trading partners and facilitate passenger movement. But ports also need allow the ORE industry to co-share the resources they have, to ensure that delivery of the governments ORE targets is achieved, and with the economic benefit accruing to Ireland. This can only be done by being able to use the ports on the island of Ireland. The new National Ports Policy should endeavour to set out a policy that is overarching and brings all these objectives together and maximise Irelands valuable port resources.

The Department of Transport, for its part, is also integral to this which makes this consultation on National Ports Policy so important. It is an opportunity to link the port policy of these strands together. The 2013 National Ports Policy does not address the ORE opportunity and the intent to include the Development of Offshore Renewable Energy as part of the current consultation process is very welcome. The delivery of the above-mentioned offshore wind energy targets is acknowledged.

In the consultation document it states ''Following the completion of the assessment the Minister for Transport decided on a multi-port approach to the provision of the necessary port facilities.'' [2] This was based on a comprehensive report completed by IMDO called IPORES 2018, [9] and the challenge is that though the framework used is comprehensive, 6 years has passed since this report was published and the wind industry has made major strides in scale of the technology.

An example is that the typical turbine size used in the modelling in the report was 10 MW whereas today a typically turbine is a 15MW unit used in the 3.2 GWs awarded in the ORESS 1 auction in 2023.

Examples of metrics that have changed - a 10 MW nacelle, including the turbine, weights 400t rising to 500t plus for a 15MW unit, while the diagram below shows that the rotor diameter have grown from 174m to 240m. Blades on the 10MW weight 35t each while on the bigger model can be up to 65t, all model dependent. This growth in dimensions has a direct correlation with the ability of a port to handle, lay down, lift and unload and load vessels and possibly the draft of the vessels using the port with increased load. With a 25MW turbine currently being developed and 20MW turbines being trialled, the port facilities will have to be able to handle this growth, and the port should not be a limiting factor and thus future proofed now.

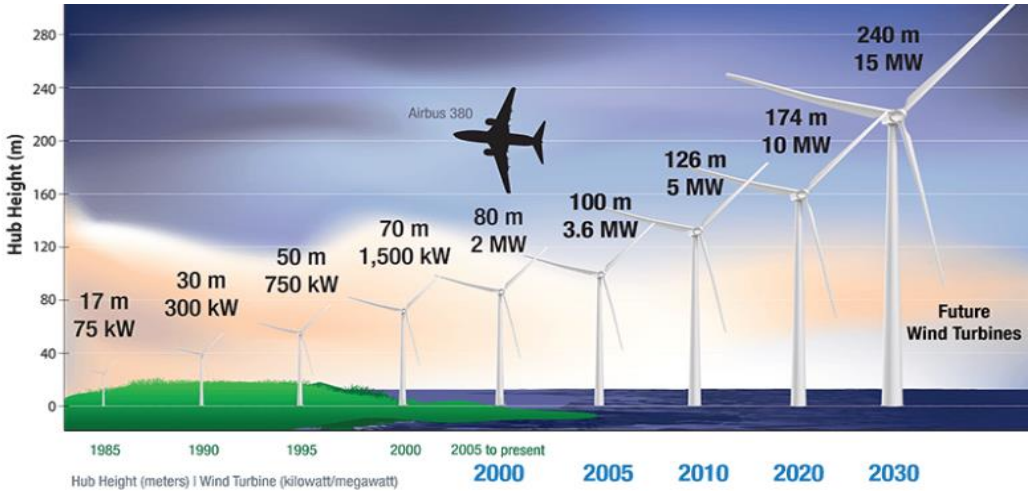


Figure 42 Wind Turbines are large and heavy and port infrastructure must be designed with area, space and capacity today to accommodate Ireland's renewable energy targets [7]

The volumes also used to model in the IPROES 2018 need to be redone in light of the accelerated requirement and review of the output needs to be used in decision making and policy development. A multiport model will be required when the Operations and Maintenance factors are included, but a specialised and focus port structure will be required with accelerated investment into both fixed and FLOW installation ports.

Using a National Renewable Energy Laboratory (NREL) model as a template, the following would be indicative volumes that will be required to deliver the 7GW programme.

Table 2 Minimum requirements of Irish Ports to deliver 7GW offshore wind [8]

Requirements	5GW Fixed Ireland	2GW FLOW Ireland	7GW FLOW Ireland
Turbines/Nacelle	340	135	475
Foundations/Floating Platforms	340	135	475
Tower	340	135	475
Hubs	340	135	475
Blades	1020	405	1425
Fully-time Equivalents ave. annual workforce	2,000 to 8,200	800 to 3280	2,800 to 11,480

Assuming on average 15MW turbines used
Extroplated from an NREL document

The rapid growth of floating wind has accelerated greatly from 2018, when the IMDO report was completed. There would have been only circa 30 MWs of trial farms installed at that time. As of the end of 2023 there is now close to 200MW's installed, with some 240 GWs in the pipeline globally. Installations of 14MW turbines have been planned with the UK planning some 15MW turbine sites. The considerations discussed for fixed bottom are very relevant to FLOW, but added to this is the need to build these units in the port and store in a dedicated wet storge area is an extra requirement.

The consultation paper also refers the Port Capacity Study (2023) carried out by EY DKM ARUP, 2023[13], issued by the Department of Transport (DoT), confirms in its conclusion that Ireland should have sufficient port capacity for all modes—RoRo, LoLo, Dry Bulk, Break Bulk, and Liquid Bulk—until approximately 2040. "If the planned developments are put in place in time, then the capacity will be sufficient to meet the forecasted demand in the highest growth scenario". **But the ARUP, 2023 study made no mention of the ORE industry** which is meant to co-exist at the same locations and overlapping on the resources of these ports. Once the scale of ORE is factored in, it is obvious that the ports mentioned in the Arup study do not have capacity for growth unless they are upgraded soon.

In any discussion on Irish Ports and the essential role that they will play in the rollout of offshore wind farms, there are many factors that need to be addressed in a port review. There have been a number of notable reports such as the National Port Study by Wind Energy Ireland (2022), IMDO IPORES 2018 study, along with Wind Europe 2030 Vision for European Offshore Wind Report (2021) and North Seas Offshore Wind Port Study 2030-2050 (2023), to mention a few. A common theme in all these reports in the necessity for ORE ports to have ample space and free access to the resources of the ports in question.

The North Seas Energy Cooperation, of which Ireland is a member, and the objective was to analyse the offshore wind port infrastructure needs in each of the NSEC member countries. The North Seas Offshore Wind Port Study 2030-2050 [7] puts in succinctly when it talks about the 5 key challenges for port development. The 4th challenge is listed as 'Competition for space'. It says that 'ports have limited space and a large demand coming from other (future) uses with more certainty, returns and clear

[13] https://assets.gov.ie/274073/b39b9cbc-d9f5-4ec5-aa13-01b90e105090.pdf

requirements.' While the various reports mentioned above, set out the requirements for space and resources, has the practicality of the demands of competing activities been addressed and it should not be a core part of any new policy.

The other 4 challenges for completeness sake are listed in the figure below and they are relevant and should be part of the policy review, but for this submission the focus has been on the availability of space in Ireland to support this rollout.

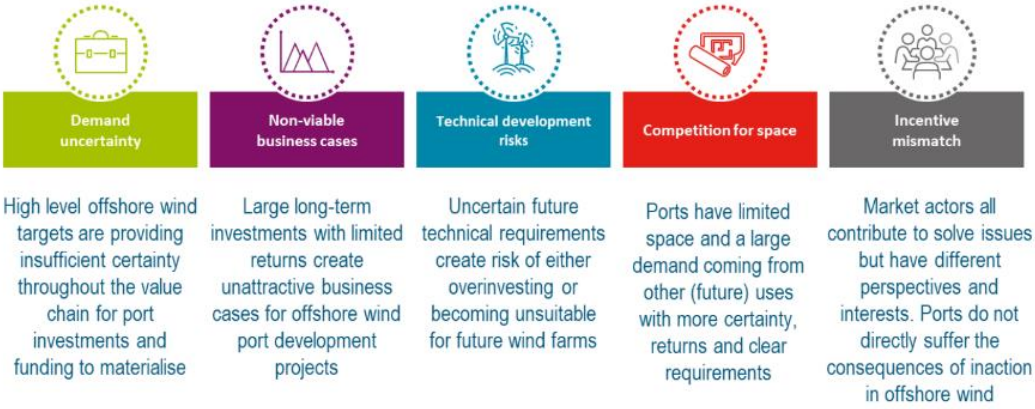


Image source: North Sea Offshore Wind Port Study 2030-2050

Figure 43 Key challenges for port development [7]

The report concludes the following with regards to Ireland ''Considering the timeline of the offshore wind ambitions, and the fact that institutional development (policymaking, application procedures, governing body) is still in progress, the timelines are quite ambitious. Significant investment is required for ports to realise these ambitions, with all large-scale plans indicating cost estimates of more than €100 million per site. Several locations have relied on funding from the EU's Connecting Europe Facility (CEF) to support the developments and, in June 2023, €11 million in co-funding was approved for Doyle Shipping Group in Cork and Irish Rail in Rosslare. In a study for the Dutch Embassy in Ireland, Royal HaskoningDHV (RHDHV) estimated that, **if Ireland wants to do all the main offshore wind activities in its own ports, a total investment of €2-3 billion would be required**. If the focus is just on O&M and partial construction support, the investment needed is expected to be closer to €1 billion.'' [7]

It does welcome the Irish government initiative in the Development of a National Industrial Strategy for Offshore Wind 2023 and this current National Port Policy review, as an opportunity to pave a way forward in making use of the available port infrastructure and tackle the main issues with regards to port availability.

It is worth noting that if the investment is not made to the Irish ports the payback to the economy will not be realised until the work is done. **Belfast is the only port on the island that can support fixed bottom installations at this time,** [129]**, with the other option to use other UK or EU if available to us.** Considering these regions aggressive offshore plans, the question of available capacity would be an area of concern. It is also noted in this report that 150 nautical miles (278km) is the ideal distance of the port to installation field, though an ARUP paper talked about 200km as a more ideal distance.[14]

[14] https://www.arup.com/-/media/arup/files/publications/p/ports-for-offshore-wind-the-net-zero-opportunity-scotland-ces-arup.pdf

The economics of the project then comes into play. While Belfast is within this distance to cover the 3 sites awarded contracts in the ORESS 1 auction it could not service the west coast project.

Currently for FLOW there is potential to have this work done in the likes of Foynes and Cork, but this has not been realised yet. The need timeline is a few years away as of yet, but the policy should address the requirement for the provision and of suitable ports to be developed.

The role of Irish ports and the development of Irelands Offshore wind industry are inextricably linked. So too is the success of the rollout of offshore wind to capitalise on the opportunity that must be realised to assist in not only de-carbonising Irelands energy infrastructure but also assist in exporting green energy to Europe in the form of both electricity and green fuels such as hydrogen helping to enable Europe's success in this area, as well as delivering major commercial value to Irelands economy.

Ports are the kernel of Irelands evolving ORE project and it is critical that ORE is given significant prominence, if the Government targets, as set out in its Offshore Renewable Energy Development Plan II, are to be realised [110].

Ports are central to the development of offshore wind. Wind Energy Europe put it succinctly when they said that ports play a key role for the local supply chain, logistics and supporting infrastructure (e.g., storage of components). Ports are where operation and maintenance of offshore wind farms are run, where all offshore wind turbines and other equipment get transported, and where floating turbines are assembled. And they will have a prominent role in the production and distribution of renewable hydrogen [130]. Within the European context the following infographics from Wind Europe captures the European potential.

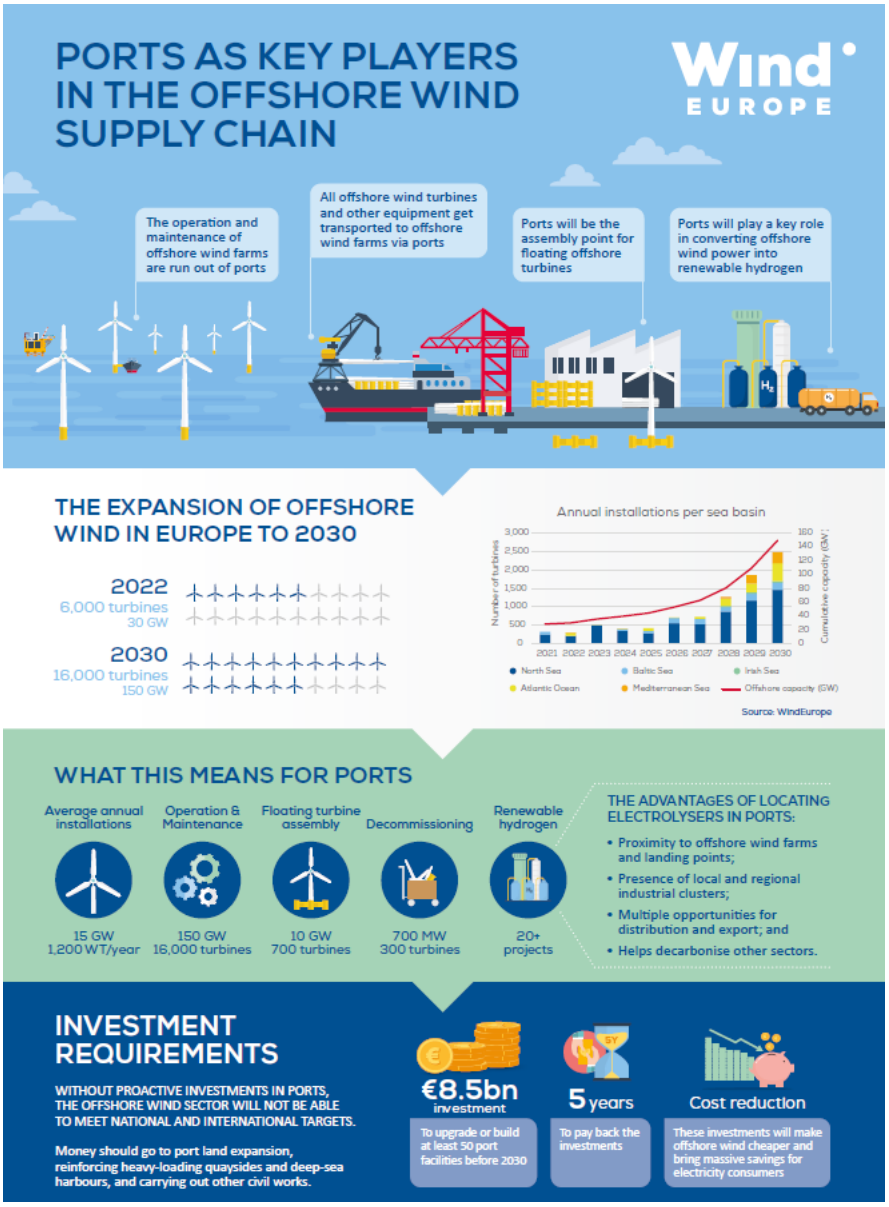


Figure 44 Ports support ORE supply chain, low-cost energy, the energy transition, jobs & economy [11].

Ireland plan of 7GW's is a 5% of the European plan but will require significant infrastructure sharing and port enhancements (some of which has already begun) within Ireland ports to deliver this ambition and reap the economic advantages of the fledgling ORE industry.

The previously mention NSEC Offshore Wind Report 2023 itemises the key challenges facing the Irish Port sector, while acknowledging the completion of this new Ports Policy, as follows:

- ► Currently Irish port capacity is not ready for expected size and scale in offshore wind
- ► Private ports invest on a commercial basis, uncertain demand is limiting investment options
- ► Support and funds are required to support Irish ports with their business case to invest
- ► Lack of regulatory framework for offshore wind, ports and hydrogen
- ► Permitting & consenting procedures need to accelerate [7]

The urgency around the delivery of Ireland ORE commitment was reinforced with the issuing by the NSEC in November 2023 of an indicative schedule (see below) showing Ireland delivery commitments. [131]

It shows Ireland commencing rolling out its ORESS 1 sites in 2026, with ORESS 2.1 following in 2028, and ORESS 2.2 in 2029. Can we ensure that are ports are ready to support this work or are we putting this work elsewhere?

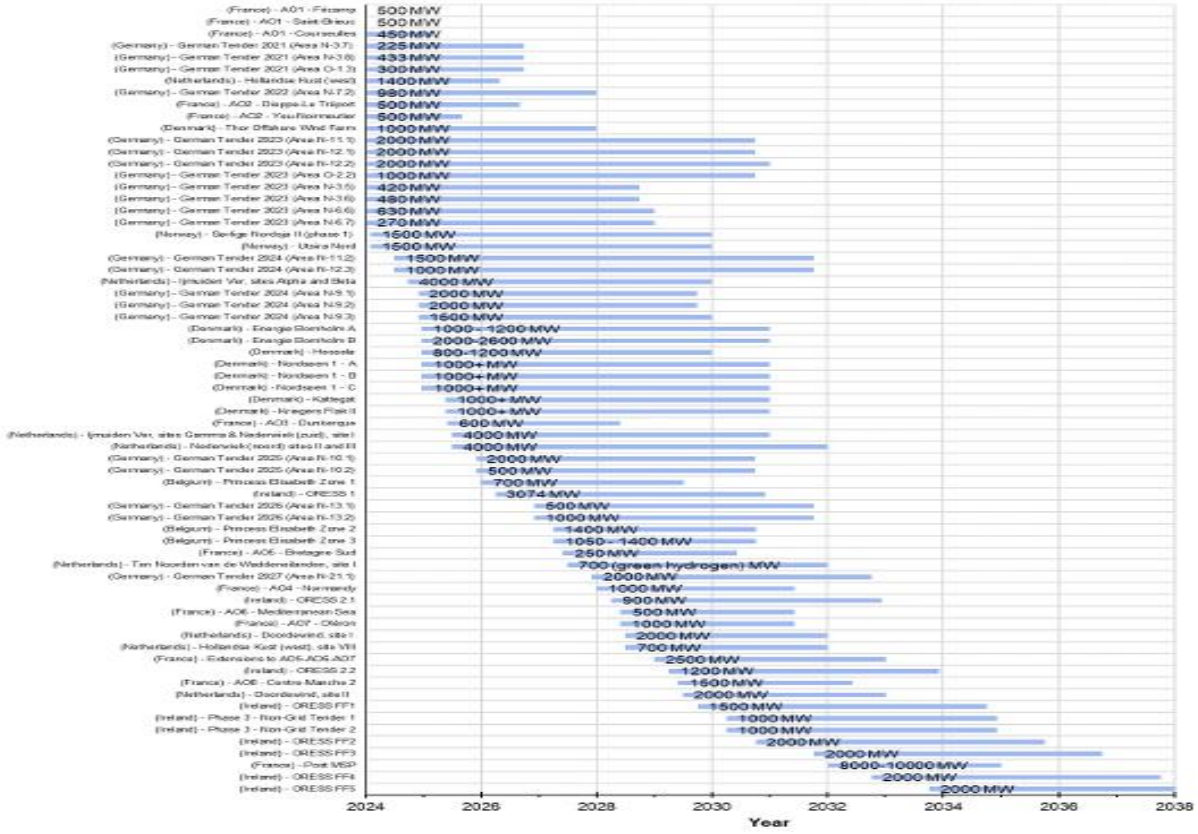


Figure 45 ORE Construction schedule 2023-2035, ports will be busy [12].

It is worth also noting that the Department of Enterprise, Trade and Employment in its White Paper on Enterprise 2022-2030 [87], Statement of Strategy 2023-2025 [132] and its subsequent Public Consultation on the development of a National Industrial Strategy for Offshore Wind 2023 [86] sees the opportunity to develop a long term industry presented by ORE industry. The White Paper captures the opportunity as follows:

*The scale of our offshore wind potential, when coupled with hydrogen production, offers a **'once in a century'** industrial development opportunity as well as a high value export capability. It will not be simple to deliver but with the right policies, and industry buy-in, it has the potential to transform Ireland's economy. A proactive, positive industrial energy development approach will meet the needs of a rapidly evolving energy sector and the transformation of energy use by industry broadly. This will include developing a domestic supply chain and exportable expertise in renewable energy opportunities, including offshore wind and hydrogen. For example, Ireland could lead globally on the design, build and remote monitoring of floating offshore platforms and monitoring technology.*

To deliver of this objective, ensuring that our National Ports Policy can facilitate this, by maximising what we in Ireland can do ourselves within the country and ensure that our ports can primarily deliver the connectivity that is required but also co-exist and thrive with ORE operating from Ireland own ports.

Dear Minister Ryan & the Department of Transport Office Team,

As Assistant Professor of Dublin City University, 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 research projects with Irish & EU academic & industry partners and government bodies such as Science Foundation Ireland & Sustainable Energy Authority of Ireland (SEAI).

I am a FEL alumina of the World Energy Council & 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.

I am a task force advisor to the IEA on Energy Storage.

I am co-founder and outgoing chair of Hydrogen-Ireland. 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.

Myself & my research team in SFI funded projects HyLIGHT & NexSys have developed the following section for your information and review. We hope it assists our country's energy, transport and industry sectors energy transition and national emissions reduction ambition/achievement.

I am available to be contacted to clarify any topic or answer any questions you may have.

Kind Regards,

Dr James Carton
Assistant Professor in Energy & Sustainability & Hydrogen
Mechanical & Manufacturing Engineering, Dublin City University

Bill Duggan BSc, MIE, MBA.
Offshore Wind Energy Expert & Researcher
Mechanical & Manufacturing Engineering, Dublin City University

Executive Summary:

The following reply is a reply mainly to Questions 1(a) and 1(b)

- The components of an ORE system are well laid out and address the main processes in section 1 of the draft policy statement. There is an acceptance of the need to look to the maturity of technology and we would support that point but would look to see if the approach of **plan-led** may also be applied equally here. This would be done in consultation with the industry and in particular the turbine companies, looking at approving step level changes in MW rating of turbines, only as installation-based proof can be given on reliability, robust supply line and availability/capacity. This will assist in adding certainty to the rollout plan of Irelands ORE, and while it might seem to contradict the 'maximisation of more competitive technologies', it does not, as a technology is only competitive if it is proven to be reliable and obtainable. Bigger may well be better in MW capacity terms but only when it is proven and deemed to have reach an agreed level of maturity. The criteria would be drawn with the industry. The turbine size has a knock-on effect on all the components of the ORE system.

- Technology used in the building of the floating platforms in the FLOW scenarios is noted as being steel. The advocation of concrete as a mainly locally sourced solution within the island of Ireland should also be considered and run in all modelling, as in Workstream 4. In the following pages the reason for this consideration is documented, and we believe would be more beneficial to Ireland and its economy making us more self-sufficient in this aspect of ORE development. All this is dependent on the finalisation of the design of a suitable solution, which is believed to be possible.

  Equally, concrete has a role in gravity-based foundations but there is insufficient information available, to the authors, to comment on the need for this type of base within the ORESS 1 developments. If there is a need it would be an excellent lead in to concrete being used in the ORE rollout.

  The use of concrete will feed directly into **question 4(a).** as a required skilled workforce will be required in the related processes attached to using concrete and will develop on skill sets already available with the construction industry in Ireland. Steel fabrication required for the steel solution would not have a similar skill set to build upon.

- As pointed out in the draft policy document ports are required to progress ORE and ''distinct infrastructures are required depending on the technology, particularly in the case of fixed bottom compared to floating wind.'' In the attached the points being made are that –
  - Concrete sets different requirements on the port infrastructure, but also creates opportunities for the ports.
  - Belfast can not be assumed to available as it could be consumed by the UK planned rollouts.
  - Developments of Irish port infrastructure does not seem to be recognised in the WS documents as progress seems to be progressing and possibly availability might be earlier. The policy should look to develop Irelands own ports to support the schedule.

- End of life planning should be factored in even at this stage as it will have a direct effect on port infrastructure, supply line and logistics. While it is appreciated that the expected life cycle can be in the region of 20-25 years, the ramp up will commence in the 2040's and should be in the policy document.

In relation to question 1(f). the industry needs to be the partner of the government in assessing technology maturity with the government in effect becoming the gatekeeper in the maturity of technology step changes. Maturity of technology is discussed in the attached, and with a mature product, suppliers who see a commitment to a product type for a set period in time, will be able to present a robust commercial proposition and they can match with schedule visibility.

Also, if the cement/concrete route is chosen, the cement industry needs to partner with Government to deliver a low carbon product for the benefit of bringing down the countries carbon emissions level.

Introduction:

Much of the focus of this submission is based on the methodology and assumptions made within 'Workstream 4: Export viability, policy considerations, trade and investment opportunities.' [88], which is the part of the package associated with this consultation and was prepared by BVG Associates on behalf of DECC. The workstream looks at the economic impact of offshore renewable energy deployment and presents its outputs in terms:

- Local gross value added (GVA)
- Direct and indirect employment (FTE), and
- Tax take.

In presenting these outputs in these terms the question arises as to whether the assumptions actually deliver the best potential GVA, employment potential and tax take to where it could possibly reach, even taking a conservative approach. As an input document to this Offshore Energy Renewable Energy Future Framework Policy Statement, there are questions to be asked.

This consultation input document does not necessarily fit nicely into the questions raised but this will be addressed in the Executive Summary and will show linkage to the questions raised. There is no doubt that this policy document overlaps and co-exists with the output of the Public Consultation for Review of National Ports Policy which closed in January 2024 [2]; the publication in March 2024, of the National Industrial Strategy Roadmap by the Department of Enterprise, Trade and Employment (DETE) [212]; and also of interest will be the Q2 publication by the SEAI Technology Road in in Q1 2024. All these documents have to maximise the return to Ireland as we embark on the next phase of the Offshore Renewable Energy (ORE) journey.

This document will focus the following points –

1. Mature Technology approach – Plan Lead
2. Strategy of the construction of the Flow Offshore Wind (FLOW) – Steel v Concrete
3. Opportunities for our Ports
4. End of Life Planning

Discussion:

2. Mature Technology approach – Plan Lead

Consideration to be given to a plan-led, iterative approach to step changes in the turbine MW range. A maturity step would be base don a MW rating, with a proven installation track record, and the attaining of agreed reliability, before the use of the unit is allowed in the Irish ORE rollout. The purpose of this is to give assurance to the supply line chain for a period of time, and volume to the manufacturers to allow for certainty on investment into manufacturing capabilities.

In creating this Future Framework document there is an opportunity to look back at the **Plan-Led** approach and apply it to technology in these early days of the FLOW in particular. The draft document does use the terminology of plan-led and mature technology. The industry cannot chase the race on the size of the next turbine and assume bigger is better. In an industry which has been experience financial challenges within the manufacturing sector, in particular with turbines, a line of certainty will assist in the ability to work suppliers on capacity and the ability of the manufacturers to develop manufacturing around a knowledge base of what is going to used, within a time period. This stepped time period is one within which a turbine is considered, through performance and reliability metrics, to have reached a level of maturity.

A 2023 article 'Scale Up Smarter, Not Harder – Why Offshore Wind Ambitions Can Be Met More Efficiently if Turbine Growth Is Paused'. It says that the offshore industry has reached a level of maturity through early governmental support that allows the sector to be competitive against conventional power plants. This causes a race for bigger turbines so developers, understandably, can be more competitive in tenders. ''However, this has spurred a development race among turbine OEMs that has proven to be highly unsustainable for the entire supply chain and infrastructure.'' [156] The article opines that ''it is imperative that attention is shifted from cost to the value, speed, security, and resilience of the supply chain.'' Having a plan-led step change approach, over time, will increase the certainty and contribute to a successful project rollout.

The technology life cycle is a model that describes the different stages that a technology goes through from its initial development to its eventual decline. This model can help businesses, and in this case the Irish Government, and innovators understand the stages of technology development, anticipate future trends, and make strategic decisions about investment and development. [157] This can be defined in 4 stages–

a. Innovation stage – initial development and introduction – untried
b. Growth Stage – The technology is now refined, and new competitors enter the market – it becomes the new norm. Competition will be centred here, and products will develop and be able to show real performance metrics in the environments that in Ireland case, can equate to the environment in the Atlantic for example.
c. Maturity Stage - At this stage, the technology becomes more standardized and widely adopted, and growth begins to slow down. The market becomes more saturated, and competition becomes more intense. Companies focus on reducing costs and increasing efficiency, rather than investing in new innovations.
d. Decline Stage - this when the newer technologies start overlapping as they will have completed stages and are now hitting the maturity stage, so time to move up a level.

There are many models with three, four and five stages and the one chosen is just an example. Another model talks about the stages in Innovation, Syndication, Diffusion and Substitution, but the diffusion and maturity stage equate to one another. [158] This article gives an excellent example where the decision was made by a developer to stay at a lower MW turbine as the ability to supply offshore foundations would have been slowed with the bigger turbine and when netted out the developer would have supplied a higher MW from the offshore field in the same timeframe with the smaller turbine. Bigger is not always better!

Logic says that the goals of the FLOW project will be achieved faster and more efficiently if the unstainable turbine race is not slowed down and the market can look at a mature supply line, in which suppliers can have some certainty, load the manufacturing process for a planned period of time, and deliver a mature and reliable product.

A 2023 report from Wind Europe and Rystad Energy notes under turbines in its key findings that 'Offshore wind serves as the key challenge, with a large gap between current manufacturing capacity and projected demand for the largest models.' See the graphic below.

RystadEnergy

Future supply chain risks

Key findings

Table 1: Key findings summary, selected parts of the supply chain unique to the wind industry

Segment	Industry	Sub-segment	2022-2030 demand growth*	Time to action*	Urgency assessment	Comment
Turbines	Onshore & Offshore wind	Total market	~3X *Capacity (MW)*	2024-2025		• *High inflation, low margins and an R&D race to supply the largest turbines on the market has put pressure on western OEM's ability to expand manufacturing capacities or repurpose facilities to accommodate a changing demand.* • *While onshore wind turbine size demand is relatively more stable, expansion of manufacturing is needed to match growth in activity levels in the 2030 Targets Scenario.* • *Offshore wind serves as the key challenge, with a large gap between current manufacturing capacity and projected demand for the largest models.* • *Rotor blade manufacturing represents the current bottleneck for European turbine supply, but both need a rapid expansion to meet demand in this scenario.*
	Offshore wind	>12 MW turbines	0-29 GW	2024		
Towers	Onshore & Offshore wind	All	~2.5X *Metric tons*	2025		• *Centralized tower supply for a larger range of turbines has enabled the supply chain to expand with growing activity.* • *Tower demand will be driven by a relatively high number of onshore wind turbines (compared to offshore wind) and increasing offshore wind activity and sizes.* • *Growth is expected to accelerate in the second half of the decade, creating an additional need for expansion.*
Foundations	Offshore wind	Monopiles	~12X *Metric tons*	2024-2025		• *Monopiles will remain the most popular concept in Europe, and with rapid growth in activity and turbine sizes in offshore wind, manufacturing must be scaled up quickly within the largest monopile segments.* • *Jacket manufacturing capacity less constrained thanks to O&G industry.* • *Floating foundation manufacturing must be industrialized. Today, it is characterized by pilots, demos and pre-commercial projects with one-off manufacturing and few units. From this small basis, manufacturing capacity must grow substantially towards the end of the decade.*
		Other grounded	~7X *Metric tons*	None		
		Floating	~23X *Metric tons*	2024		
WTIVs	Offshore wind	Total market	~7.5X *Vessel years*	2024-2025		• *Strong fleet additions in recent years have put supply in a strong position to cover demand in the next two to three years. Increased demand in the second half of the decade, primarily in the largest turbine size ranges will put pressure on supply.* • *A global fleet and increasing demand outside Europe will likely pull supply out of Europe, worsening the supply-demand balance, with new units forecast to be needed.* • *An increasing share of demand in the 15-20 MW range towards 2030 will also drive a need for new units, as the fleet of vessels capable of installing these units is currently limited.*
		>12 MW turbines	0-25 vessel years			

*Estimated European demand based on *2030 Targets Scenario*. Time to action refers to the estimated year when supply expansions need to be initiated to avoid a potential bottleneck.
Source: Rystad Energy research and analysis

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A 2023 report from DNV – Offshore Wind 2023 – New Ambitions, New Challenges, says the following 'With the new targets of several European countries (but also global ambitions of many regions) the demand for offshore wind related developments and the demand for equipment increased. Larger markets with increased and accelerated targets obviously require the supply chain to grow at the same rate to capture the market and to allow a healthy supply demand mechanism. However, the turbine supply for many years has been working on a much lower level and –as said above- a very volatile project driven level, which now requires a fast ramp up.

[15] https://www.review-energy.com/fileuploads/user/FINAL%20Rystad%20Energy%20-%20Wind%20Supply%20Chain%20Report-WEB.%5B1%5D.pdf

Specifically, the turbine supply chain has suffered under the cost reduction ambition in the past. The combination of a cost reduction target and the related demand for new larger technology (turbine capacity and size) led to very limited or to no scale effects on certain product lines.' [159]

In a recent strategy document from Vestas, one the leading suppliers of wind turbines, it says that the ''speed of introduction of bigger wind turbines to the market will slow'. It suggests that offshore requires a vision of 2-3 years beyond given the current lead times. Their strategy seems to be tending towards meeting a customer requirement to turbines that are workable in today's environment, rather than banking on future technology developments. [160] This strategy would seem to align itself very much with what is been said here in this submission.

There is a lot of considered opinions that we must focus on deploying the proven or mature technology we have already and enabling the development of a sustainable and scalable supply chain and on expanding the infrastructure to execute and operate our projects. 'The ongoing race to develop larger turbines poses a significant threat to supply chain investments, as manufacturers cannot be certain that their multi-million-euro capacity investments will remain future-proof and may be depreciated too quickly. This dynamic may result in investment decisions being delayed or not taken at all throughout the supply chain.' [156]

Nielsen at Vestas recently emphasised the need for responsible development. "The only way that can actually attend to the market demand is to slow down the growth of turbines," he said, adding: "This industry needs to mature, and everyone has to make money in the supply chain to make it last." [161]

Currently a 10 or 11MW turbine (depending on the supplier) is perceived to be relatively mature, but the expectation for Ireland would be that a 15MW turbine will be in that stage before floating commences its rollout and from a plan-led perspective a plan around that size turbine should be developed. Dogger Bank in the UK, one of the biggest offshore sites, using fixed bottom turbines, is using the GE Haliade-X 13MW turbine, while it also announced a 14 MW turbine in that range. [162] Vestas V236 is a 15 MW just having developed, while Siemens Gamesa SG 14-236 DD is also in that range at 15 MW.

In China there are bigger turbines out there in various stages of development and trials. Goldwinds GWH252 is rated at 16MW and the Mingyang MySE is also 16MW but have unveiled an 18 MW unit. GE have also said they are working on a 17MW and 18 MW unit. There are others on the way. But there would be concerns of the logistics surrounding the installation of turbines with a such a long supply line, distance wise, and the ongoing maintenance and support aspects on.

But again, we should not follow the chase for bigger machines until maturity to proven. Capacity needs to be built and stability offers that opportunity. 'Industry observers say it could be difficult to reach that level of investment if goal posts keep moving. Others are concerned about the reliability of rapidly evolving turbines, as they are still untested in the real world.' [163]

In summary, there are two inputs that should be considered -

c) Continued the Plan-Led approach to technology and set a parameter around the size of the turbine to be used based on maturity of technology, ensuring that the rollout has a higher reliability threshold and better chances of success. Work with the industry to develop that step criteria to move up in size. This window to be two to three years potentially.
d) Ports should be future proofed as part of their development plans and prepare for the bigger 17 to 20MW units in their design, though they will initially contend with say a 15MW turbine. This is the approach taken in RenewableUK document previously referenced, and is a sensible approach. [125]

3. Strategy of the construction of the Flow Offshore Wind (FLOW) – Steel v Concrete

Consideration of the potential use of concrete as an alternative to steel in the manufacture of the floating platforms should have been considered in parallel to steel. It would be expected that the value to the metrics used such as FTE, GVA and tax take would be higher for the Irish economy and the industry would be more sustainable and self-reliant. It is assumed that a viable design will be in place in time to support the rollout.

Like all processes there is an interconnection between the various assumptions made and these can and will affect the output. Whether it was due to the DECC briefing to the consultants or was assumptions made by them, it is suggested here that the assumptions used in particular to local content was not broad enough and does not give the reader a view of the potential that is possibly understated.

This section will focus mainly on the assumption made in WS 4 that steel will be used in the construction of the floating semi-submersible platform for Floating Offshore Wind (FLOW), versus the use of 'locally' sourced concrete for the construction of the same unit. A discussion could also be extended into the use of Gravity Based Foundations in the installation of the fixed based estate currently being rolled out. Concrete based foundations are used, and for example 71 of this type of unit are being used in the construction at the Fécamp offshore wind farm site in Normandy, France. [195] This is a current project. An opportunity to delve into the plans of the 4-winning tenderers in ORESS 1 has not be possible but the logic and approach to the use of concrete in supplying these base units is the same.

WS4 states the following – 'In all scenarios, it is assumed that modular foundation components are manufactured elsewhere, before final assembly in Ireland. Ireland has little of the type of heavy manufacturing industries which would carry out this work, and there is no strong logic for local supply as components are designed to be transportable. We assume Ireland will not be an investment location of choice for new facilities of this kind due to its existing capability coupled with relatively high wages, which mean investment will more likely flow to other markets.'[88] This assumptions has a knock affect job creation, port set up and the ultimate return to the exchequer.

Based on this assumption the main component parts for the construction will be steel and while the assumption is correct when it comes to this material, consideration should also be given to the use of concrete in parallel and the models run to see what benefits are outputted and how they compare. Ireland does not have a steel industrial infrastructure of this size and is potential not the route that should be followed. While in particular on FLOW, there are many designs

being worked upon with no clear direction being taken yet, designs will evolve in the coming years and there is a good chance there will be a viable concrete one when that a consensus has arrived upon.

What is the case for considering concrete?

Norwegian company called NorSea Impact AS commissioned consultants DNV, a leading consulting firm and certification body, to carry out a comparative study of concrete and steel substructures for Floating Ocean Wind Turbines, for a project they we relooking at. It looked at both a spar and semi-submersible constructions and the study indicated the concrete floaters have a lower carbon footprint and costs then their steel counterparts. [196] They assumed that the only location that could supply the volume of steel required at a competitive price was China and that still seems to be the case. A point to note is that the current war in Ukraine escalated (February 2022) around the time of the report being launched and since then the price of steel has again increased. This would certainly have influenced this report if the war had been factored in.

The report found that there would be a skills deficit in Europe to meet the volumes required for the project being assessed which was 67 units per year, similar or slightly more to a potential volume in Ireland. It concluded that Asia and in particular China offered the only potential for supply.

The report also concluded that the ability to manufacture these units existed in Norway, where the report was commissioned. It said that 'it is found that the local labour and supply chains within Norway can meet the majority of the demand generated during full production of concrete spar or semi-submersible units…. The labour and skills market has capacity to cover all positions and expertise locally.' But not the supply of the steel.

The supply line from China is also a considerable factor to note and the DNV report found that the carbon content of steel some 2.5 to 3 times higher for steel over concrete. The report delves into various hybrid solutions and examines the life cycle aspects and the inclusions of recycled materials, but still concludes that the carbon footprint is lower in concrete based units.
Just like concrete, there are many issues affecting the role of steel construction in FLOW. Depending on when the reports are published - one report has costs in offshore wind projects up some 57% (August 2023). [197] Fortune Magazine says that soaring materials costs, particularly for steel, forced turbine makers to raise prices. [198] But it also important to note that cement has also gone up in price, but the difference for us here in Ireland is that it can be sourced on the island of Ireland along with most of the other materials required in the manufacture of a concrete semi-submersibles. With China there is also large transport costs and possibly delays in delivery which you do not have with local sourced products.

It is also worth noting that with the introduction of EU Carbon Border Adjustment Mechanism (CBAM) will affect the import of steel and steel components from outside the EU. [199] CBAM, or the Carbon Border Adjustment Mechanism, is designed to prevent 'carbon leakage' by imposing a carbon levy on specific product imports from non-EU and non-EFTA countries. The levy is linked to the carbon price payable under the EU Emissions Trading System (ETS) for the same goods produced within the EU. As of now, **it does apply to steel**. It is an attempt to control the import of carbon emissions from outside the EU without additional cost and mitigation steps been taken. This was not a factor taken into consideration in the DNV report, and the implementation of CBAM started on a transitional phase on the 1st of October 2023. CBAM has initially been applied to iron, steel, aluminium, cement, electricity, fertilisers and hydrogen. All good reasons to

look for solutions from within the EU. Reporting only started on this date, but the financial side comes into play in 2026. [200]

The UK ORE market is one of the leading global markets in the world at this time. It has one of the most extensive portfolios of installations, mainly fixed bottom at this point. But it has ambitious plans to rollout FLOW into its UK wates in the coming years. It too, is looking at issues around concrete as an alternative to steel platforms. RenewableUK's Floating Offshore Wind Taskforce in its Industry Roadmap 2040 report, in March 2023, looked at building the UK Port Infrastructure required to support the rollout of FLOW. It ran both the steel and concrete as potential scenario's and was agnostic to the solution that would actually use.[125] While it looks at both solutions with merit it does not recommend one solution over the other, but recognise concrete as a viable solution.

The report recommends that more work is required as set out below and considering the history of the UK in heavy steel fabrication against Irelands history there is skills deficit here, at this time.

''The feasibility and attractiveness of concrete substructure should be further investigated. Further investigation in the feasibility, attractiveness and UK benefits of developing concrete substructures as a viable solution for FLOW. To get more clarity on the concrete manufacturing port feasibility and infrastructure requirements, the UK's potential for concrete construction needs to be better understood.

At first glance, it is expected that lower investment will be required due to the UK's existing industrial base for concrete solutions in other sectors. Additionally, it will also unburden steel supply and associated skill requirements as there will be healthier balance between the use of steel and concrete in the UK market. The question remains if concrete is going to be a widely used as the accepted solution to condone further development of infrastructure and skills.

Investigate the feasibility of modular and standard based steel substructure fabrication in the UK. UK steel substructure fabrication facilities are required to service and secure UK deployment ambitions but can only be developed on the back of highly modular and based on standard components. Standardisation of steel structural components (e.g., tubes) by designers across the industry would greatly assist the industrialisation of the fabrication industry in UK.

Multiple steel fabrication locations will be required in the UK to supply FLOW steel assembly ports; these can feed in to one or more assembly location. Considering the increase in demand from FLOW, the UK would need to bridge the gap with existing European assembly capacity. British ports and fabricators are unlikely to be able to compete with suppliers in the Far or Middle East in terms of infrastructure scale and labour cost, but with the high cost of transport there might be a case for securing supply, speciality fabrication and the value added via indigenous strengths in areas such as modern high-end automated welding must be prioritised.''

In theory the same consideration could equally apply to Ireland, but in the Irish case from a skills perspective the deficit is higher. In Workstream 4 of this consultation it would have been important to see what the value in terms of GVA and FTE would be if the concrete solution was run in parallel to steel.

Concrete manufacturing emits a high level of carbon dioxide each year. Portland clinker – cement's key binding ingredient – accounts for over 90% of those emissions. But there are alternative binders that are safe, scalable, cost-effective, and – above all – climate-friendly. [201] There has been difficulties in the EU's Emission Trading System to cater for these alternative

materials, but it is hoped it will be sorted for 2026-2030. The cement industry is also a source for green hydrogen to be used in the kilns to again further enhance cements green credentials.

There is no concrete design fully approved and ready to go as of yet, but work is ongoing and potentially a hybrid of solution is ultimately decided upon as a workable solution. But there are a number of UK reports published as there is much activity on this topic of the use of concrete as a solution for offshore platforms. There are barge designs and semi-submersibles, as well as the spar design, the latter probably not suitable as it needs deeper waters to be built in, then our potential ports have available. RWE funded Catapult to look at Manufacturing Concrete Floating Wind Foundations in Scotland in 2021. [207] It is fair to say that the floating wind substructure designs are typically based on concepts used in the offshore oil and gas industry. There is a lot of firsthand experience of these structures in Scotland. 'In the context of the rapid growth of the floating wind market in Scotland, this study seeks to understand the potential for the Scottish supply chain to manufacture concrete floating offshore wind substructures.' It concluded that Scottish supply chain had sufficient capacity in most areas, including the supply of ''lower carbon concrete''.

The following summary very much could be equated to what the capabilities in Ireland would be. Ireland has 4 companies that manufacture cement currently and Low Carbon Cement (LCC) will be available in quantities in the coming years, in line with EU requirements to get to net zero. There are aggregates available in Ireland and there is some rebar manufactured. What capacity of rebar that would be available is unknown but could be addressed. Formwork skills are available, and the post-tensioning skill availability is unknown at this time to the author. In comparison to steel fabrication, the skillsets required are different and probably more readily available or could be more easily provided for through training. This is an industry, based on the current Irish plans that has a life of some 20 plus years and beyond assuming that the repowering of the offshore windfarms continues into the future, beyond 2050.

	Could be fully sourced in Scotland (in baseline scenario)		Comments
	Now	2030	
Aggregates	Yes	Yes	• The baseline scenario is estimated to use ~30% of Scottish crushed rock aggregate supply. • There is significant logistical benefit to local sourcing.
Cement	Yes	Yes	• Carbon allocations influence cement production volumes. • Some lower carbon cement constituents are currently imported but are likely to be available in the UK by 2030. • A number of Scottish companies are already committed to net zero cement by 2050 and there is progress locally and globally on innovation to achieve this.
Rebar	Partially	Likely	• Only one rebar producer with sufficient capacity is available in the UK (Cardiff). The baseline scenario would use 10% of Cardiff producer's capacity. • The baseline scenario would exceed the current Scottish rebar supply capacity by 100%. • On-site facility for rebar cutting and forming would need to be set up at port.
Formwork	Likely	Yes	• Scottish-based suppliers would be able to supply for precast options. Slip forming (where required) would need specialist skills and rigs that are not currently manufactured in the UK.
Post-tensioning	No	Likely	• Currently no domestic supply in Scotland but inward investment likely with sufficient demand.

[207]

Another Catapult report completed for the Welsh government demonstrated that in a comparison between both steel and concrete, concrete created more employment of the magnitude of 10% plus based on installing 1GW per annum. The table below is extracted from the report. [208] It also talked about supply line issues with the steel fabrication, the high skill that was required and that the security of supply offered by construction of concrete units.

All these reports come with the point that the design for a concrete floater has not been totally validated as of yet but should have been considered as part of the workstream.

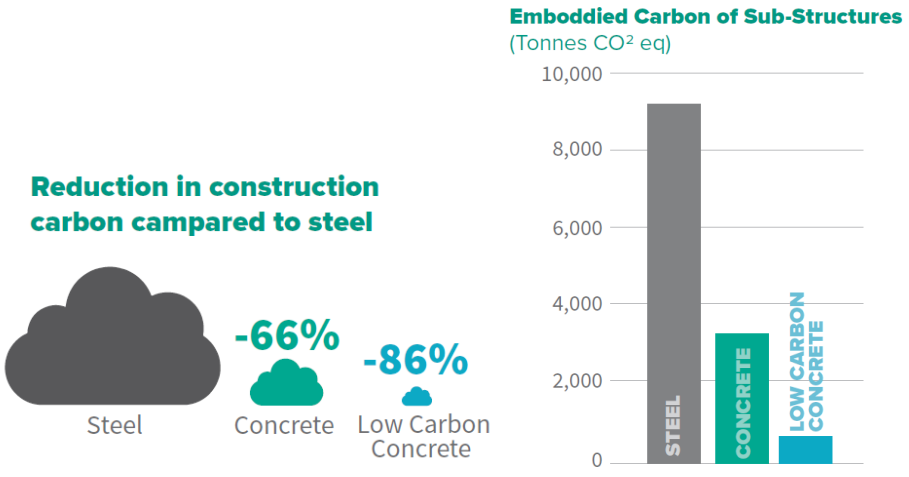
Direct FTE	Units	300MW South Wales	1,000MW South Wales	300MW North Wales	1,000MW North Wales
Steel Semi-Sub Substructure Assembly	FTE	305	684	305	684
Concrete Semi-Sub Substructure Assembly	FTE	362	747	362	747

[208]

Note the number of jobs will increase as the volume of installations will possibly be of the order of 2GW's and these semi-submersible units will be made in more than one construction port – possibly two or three.

It would be insightful to see the comparison of this locally sourced solution to the platform translate into the GVA and FTE figures as the supply more or less in totally on the island of Ireland, modelled as part of Work Stream 4. There is no reason or explanation given in the documentation that has been found.

A final UK reference report that will be mentioned is a report issued in 2023 on behalf of the Cornwall FLOW Accelerator – Concrete for Celtic Sea Flow, and it outlines a regional concrete plan for the south east of England. It says that with sub-structures being the single highest value component, they present a realistic route to capturing desired levels of local content and maximizing socio economic gain for the region. The focus on carbon emissions is a useful insight as demonstrated in the following diagrams which are self-explanatory. [205]

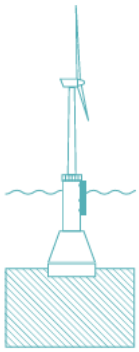


[205]

There is work been carried out in other countries such as France, Norway, Italy and Spain, without exploring China and the Far East, on the use of concrete as a solution. An example would

be Norwegian company Plav Olsen's 00-Star Wind Floater concept. [206] There are also many technical studies being carried out as there is much research ongoing.

This submission has not discussed the use of concrete in the fixed wind turbines in the initial phases of the Irish rollout following the ORESS 1 auction. There is a gravity-based foundation made from concrete that is a possibility, but without knowledge of the installation sites and the plans of the developers, there is no comment to be made at this point. The use of gravity-base foundations for installation of offshore wind turbines offers a potentially low-impact alternative to traditional construction methods for wind turbines such as pile-driven monopile and/or jacket foundation installations. [209] These are normally made from concrete and would be built portside in a construction port. Gravity Base Structures are the oldest and simplest foundation type, relying on the weight of the ballasted concrete base to provide stability. The volume of materials needed for depths beyond 35m makes them very expensive for deep-water sites. The fabrication and installation requirements are totally different to other fixed bottom foundations.



Suitable for depths of 15m to 40m[16]

There are many references discussing the benefits gravity foundations such as a recent one from Newcastle that found that they are potentially a marine-friendly future for wind turbines. [210]

The recent French installation at Fécamp Offshore Wind Farm used 71 concrete gravity-based foundations in depths of 25 to 30 meters and weight 5,000 tonnes each. [211]

Wind Energy Ireland in their 2020 report Harnessing our Potential said that concrete structures (e.g., gravity-based structures) are more amenable to local production, due to the challenges of lifting and transporting them between different locations. Concrete fabrication facilities require comprehensive facilities that may require considerable up-front investment. A large pipeline of projects is usually required to justify such investments; this is not likely to occur as the use of concrete structures is decreasing. [17]

Has consideration been given to the use of concrete gravity-based units in the rollout of ORESS 1 sites or considered in the work stream deliberations? It is another opportunity to bring jobs into Ireland rather than export them overseas. If there is potential for gravity-based foundations not data could be found at this time.

[16] https://www.empireengineering.co.uk/wp-content/uploads/2021/08/The_Empire_Engineering_Guide_to_Offshore_Wind_Foundations_eBook-1.pdf
[17] Https://windenergyireland.com/images/files/final-harnessing-our-potential-report-may-2020.pdf

4. **Opportunities for our Ports**

The use of concrete has an effect on port planning and construction. The units are much heavier and the load bearing characteristics of quays are much greater. Ports need some certainty when they finalise their design work and now is the time to future proof the requirements.

If the premiss of accepting the potential use of concrete as a possible alternative to steel in the rollout of FLOW, the impact on ports has to be factored in, as well as the flow of the assembly of process the FLOW turbines onto the platforms.

There has been a recent Ports Policy consultation so this input to the current consultation will not be dwelt upon, but a few points will be made.

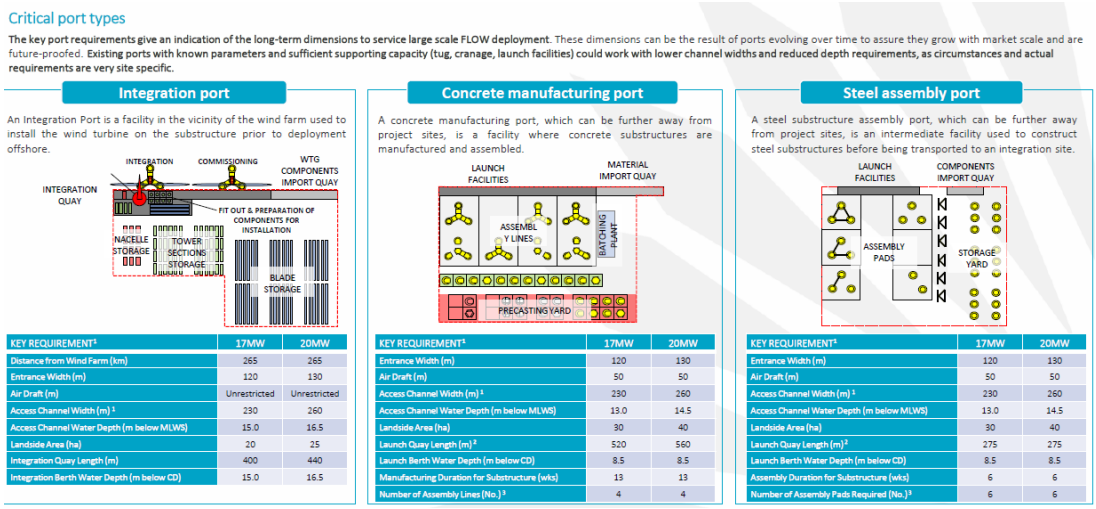
If concrete is considered for the FLOW installations, there are considerations that have to factored into port planning and will only be mentioned here briefly:

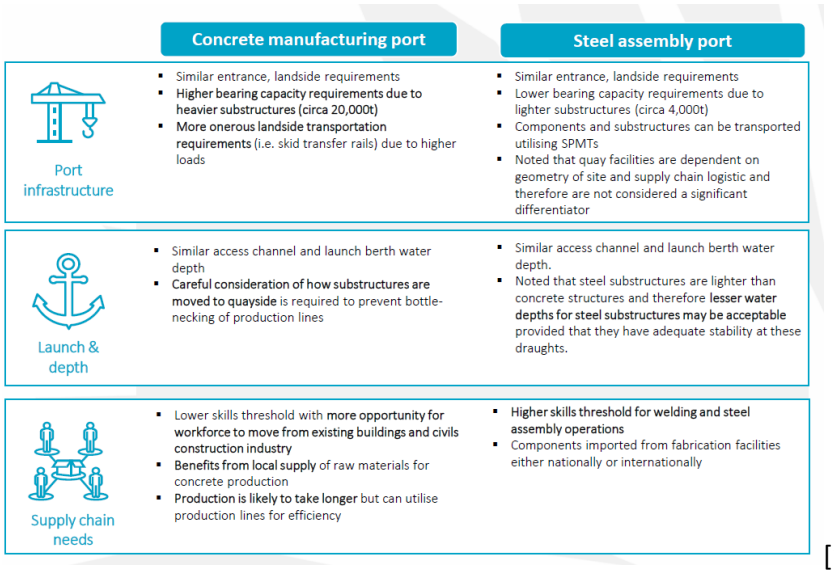
- Workstream 4 mentions Belfast as the only port available on the island of Ireland to support the early phases of the ORE rollout. This is correct, but Belfast is also considered as a resource for the UK rollout of ORE. Has the assumption of the unavailability of Belfast been examines and what the effects on the plan will be. Consideration of the work ongoing progress in Rosslare [145] and the potential of Bremore [143] should be noted and while it does say that Irish ports can pick up the balance not catered by Belfast, consideration needs to be given an unavailability scenario, and expediting of the above-mentioned ports.
- Belfast is only a solution for fixed bottom installations. The document also suggests that investments in ports has not been triggered yet, but this does not seem to be the case. Rosslare is very proactive while other ports are actively engaged in their development.
- In the previously mentioned report by RenewableUK, Building UK Port Infrastructure to Unlock the Floating Wind Opportunity, [125] , they consider three port types in their considerations as per the diagram below. There is much detail in the report but just as mentioned in the BVG report there will be a number of manufacturing and installation ports required, depending on the rollout volume. The manufacturing ports will be an all-year-round operation and can manufacture 12 months of the year. Both type of ports (concrete and steel) will manufacture a similar quantity per year and do not need to be co-located with the installation ports.

  There is no preference indicated in the report, one over the other, but the concrete will require a longer quay length. This is a limiting factor but as ports are being developed it is a consideration. The importance of this is for example, looking at Foynes Development from the outside, and with the location of the cement plant near the Shannon estuary, allows for the opportunity to manufacture potentially close by. If there is a manufacturing in the estuary and the opportunity now to develop this aspect accordingly there should be the ability to assemble the floating unit with turbine and all, within an installation port in the estuary and doing it portside rather the suggested jack up vessels in the harbour. The aim has to be to do it portside and should be part of the Future Framework policy, linking into the new Port Policy. Waiting till 2038 for this facility to be available seems very long and should it not be earlier?

The use of the imported jack up vessels and their foreign crews is an understandable solutions outlined in WS4, but the focus should be by early 2030's to at least to have one port in place to support this approach. It would be hoped that Cork could also be on line as well as Foynes, for floating as well, and any other suitable port. Rosslare and Bremore would be fixed based units only it would seem.

- From a port perspective there are challenges with Concrete over Steel when it comes to your ports structure, but all can be overcome with a clear and PLAN LED policy, indicating the direction of travel. The RenewableUK, which reflects similar thinking to other previous mentioned reports when it comes to ports - Manufacturing concrete floating wind foundations in Scotland [207], Floating offshore wind sector report: non-technical summary | GOV.WALES [208], and Concrete Position Paper 2023', Celtic Sea Power [205]





[125]

These concrete units are up to 20,000 tonnes so the load bearing ability of the port is a key consideration. Again, this is a key element if this policy is adopted and should overlap with the upcoming Port Policy

In summary, this input to this Future Framework Consultation, is advocating the re-running of the WS: 4 to investigate whether the process surrounding the use of concrete has a

significant benefit to the returns to Ireland in doing this FLOW project. It also has implications for the fixed installations, if Gravity-based structures are required. It has a direct knock on the skills required in Ireland; the planning required around indigenous ports and their direction of travel and the necessary PLAN-LED development assistance to be given.

5. End of Life Planning

Provision for end-of life needs to be part of considerations as it will start coming into play in 2040's. The request is that is acknowledged in the policy statement and that provisions are made for space at ports, a review of what the best strategy will be to be done in time, and provision for ongoing headcount to be allowed for this activity.

Though addressed somewhat on the webinar number 2 by BVG (Leo Bartels), and with planning running out to 2060 in some of the slides, it is believed that by 2040's this matter will become a factor. End-of-life planning for offshore wind installations will be a reality for the infrastructure, ports and supply line. It would be hoped that this sector will contribute to the economy for a significant period of time.

Catapult outline the various scenarios that could be considered and possibly this out of scope, but it worth noting in the Future Framework document as a key step. The scenarios looked at were as follows:

• Full removal • Partial removal • Full repowering • Partial repowering, and • Life extension [18]

They talk about an end of life of 25 years, but other reference talk about blades having a life of 20 years, for example.

The purpose here is not delve any further into this at the point but this needs to be factored into all planning scenarios. Which of these scenarios might relevant is not for comment here, but some scenario will apply. In the harsh conditions of the Atlantic a stated life for a turbine at 25 years may be a challenge.

[18] https://ore.catapult.org.uk/wp-content/uploads/2021/04/End-of-Life-decision-planning-in-offshore-wind_FINAL_AS-1.pdf

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